AGRICULTURAL *Chemicals*

IN THIS ISSUE:

JANUARY, 1957

There's a Fungus Among Us

THE CASE OF THE POISONED POTATOES

Verdict:

County Court of Appeals finds Joe Grower GUILTY as charged . . . guilty of permitting his potatoes to become infected with Scab and Rhizoctonia (black scurf, stem canker, damping-off and sprout burn-off). This situation could have been prevented if Joe Grower had treated his soil with TERRACLOR—Olin Mathieson's new fungicide for certain soil-borne diseases . . . available as 10%, 20%, and 40% dust . . . 75% wettable powder . . . 2 lb. emulsifiable. Joe Grower's neglect is particularly regrettable since one application of TERRACLOR is often effective from planting time to crop maturity.

Sentence:

The Court feels that Joe Grower will suffer enough from crop damage. However, he is warned against permitting soil-borne diseases to poison his potatoes again. He is also urged to use TERRACLOR for controlling other soil-borne diseases such as club root, black root, crown rot, root and stem rot, leaf drop, bottom rot, and common smut when growing alfalfa, clover, green beans, lettuce, wheat, cotton, crucifers, and certain ornamentals.

Terraclor

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INSECTICIDE DIVISION • BALTIMORE • LITTLE ROCK

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Parathion • PCP • Phosdrin • Phytomycin® • Rotenone • Seed Protectants • TEPP • Toxaphene • Weed and Brush Killers

To all our friends, Happy New Year!

May your hearths burn bright and your
loads be light.
Your cup brimful with cheer.
And may all go right, without
drought or blight
Throughout the coming year.

P.C.A.
The SALT of the EARTH
RED MURIATE

POTASH COMPANY OF AMERICA
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TRONA® POTASH *for Agriculture*

In 1917 state fairs were awarding prizes for outstanding farm products just as they are today. Then as now, growers depended on Trona MURIATE OF POTASH for high quality crops. For it was in 1917 that Trona, first to produce domestic Potash when World War I pinched off foreign sources, shipped the first train-load to the east coast. Since that time, even with American Potash and Chemical Corporation's broad diversification program, Trona is still one of the primary basic suppliers of high grade Muriate and Sulphate of Potash for Agriculture.

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SODA ASH	PERCHLORATES
SALT CAKE	MANGANESE DIOXIDE
LITHIUM	

—and a diversified line of specialized agricultural and refrigerant chemicals

MURIATE of POTASH, agricultural grades 95-98% KCL, (60% K_2O minimum), regular and granular.
SULPHATE of POTASH, agricultural grade, 95-98% K_2SO_4 (51% K_2O minimum).

TRONA

American Potash & Chemical Corporation

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214 Walton Building, Atlanta 3, Georgia

Plants · Trona and Los Angeles, California; Henderson, Nevada
San Antonio, Texas (American Lithium Chemicals, Inc.)

Export Division · 99 Park Avenue, New York 16, New York

AGRICULTURAL *Chemicals*

This Month's Cover

Officers of the Entomological Society of America, at the annual meeting held December 27-31 at the Hotel New Yorker, New York City. (l. to r.) R. H. Nelson, executive secretary; B. A. Porter, USDA, retiring president; and H. M. Armitage, California Department of Agriculture, Newly elected president.

MEMBER AUDIT BUREAU OF CIRCULATIONS

Vol. 12, No. 1 January, 1957

AGRICULTURAL *Chemicals*

ARTICLES

FEATURES

PUBLISHED monthly on the 1st by Industry Publications, Inc.
ADVERTISING and Editorials office. P. O. Box 31. Caldwell, New Jersey.
PUBLICATION Office: 123 Market Pl., Baltimore, Md.
CHICAGO ADDRESS: P.O. Box 126, Park Forest, Ill. SKyline 6-4499.
ENTERED as second-class matter November 4, 1949 at the Post Office at Baltimore, Md., under the Act of March 3, 1879.
SUBSCRIPTION RATES: United States, 1 year, $3.00; 2 years, $5.00. Canada and Pan American countries, 1 year, $4.00; 2 years, $7.00. All other foreign countries, 1 year, $9.00; 2 years, $15.
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When we checked International's

"How to get an extra 212 lbs. of nitrogen solution in each ton of triple"

says Mr. W. R. Edgecomb, Treasurer and General Manager of the Aroostook Hi-Test Fertilizer Company, Presque Isle, Maine

With International's triple we use 666 lbs. of nitrogen solution* per ton, reports Edgecomb. With another triple, our ammoniation rate was only 454 lbs. of solution per ton.

*24.5% free NH_3; 56.0% Ammonium Nitrate; 10.0% Urea; 9.5% H_2O.

A calibrated measuring tank is the heart of Hi-Test's batch ammoniating system. Triple is ammoniated as it is unloaded from rail cars.

Superior ammoniation qualities make International's triple ideal for high analysis fertilizers. Complete ammoniation reduces chance of setting up.

The Hi-Test plant mixes four grades of high analysis fertilizers . . . all sold under the Hi-Test brand name. 80-pound bags are moved by conveyor.

ammoniation rate, we learned

Superior ammoniation qualities are important reasons why Mr. W. R. Edgecomb (left) and Mr. Harry W. Trask, Sales Manager, are satisfied users of International's triple super.

"WE LEARNED by experience. Our ammoniation rate proved that International's triple had the superior ammoniation qualities we were looking for," says W. R. Edgecomb, of the Aroostook Hi-Test Fertilizer Company.

"We ammoniate 1500 pounds of International's triple with 500 pounds of nitrogen solution. This gives us a base of 11.1% nitrogen and 35.2% A.P.A."

Compare these results with the ammoniation rate for the triple they previously used — 370 pounds of solution for each 1630 pounds of triple. It's easy to see why International's triple helps this Presque Isle, Maine, firm hold down formulation costs . . . why they are really sold on International.

From the time they receive the triple at their plant siding . . . this highly efficient fertilizer plant operates to take full advantage of the many savings offered by International.

First of all, water shipments to Searsport, Maine, help hold down the cost of the delivered goods. The triple is then shipped by rail to Presque Isle.

Then Aroostook ammoniates the triple from the track. The triple passes through a batch ammoniating system featuring a calibrated measuring tank.

This ammoniating procedure, says Edgecomb, gives them superior results and reduces the possibility of the ammoniated triple setting up. And in addition it gives the material a more desirable granular texture.

What's more, with International's triple they are able to unload a car of nitrogen solution in 1½ days . . . a saving of a full half day. This in turn helps avoid any extra demurrage charges.

This system enables Hi-Test to handle large shipments of triple during the slack season and save on freight. With four men working, they can ammoniate 90 tons of triple (121 tons of base goods) in a normal working day.

If you have not already tried International's superior product — the triple with a guaranteed constant minimum of 46% A.P.A. — put us to the test. You too will become a satisfied customer.

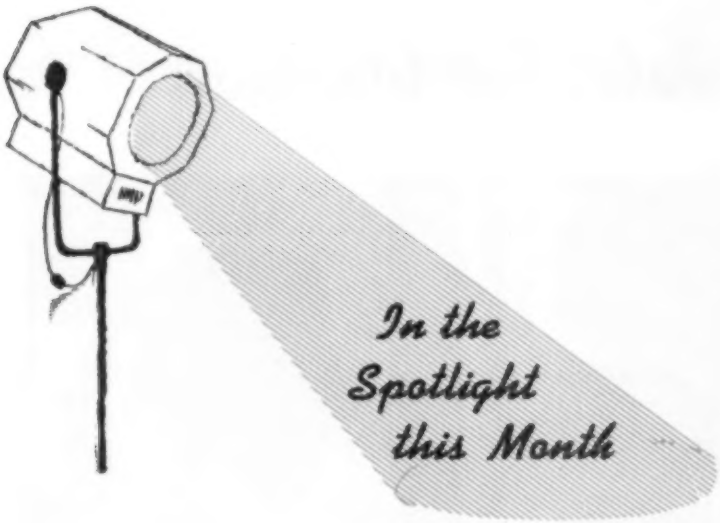
Write or wire International Minerals & Chemical Corporation for full information on prices, shipping and warehousing arrangements.

PHOSPHATE
CHEMICALS
DIVISION

MINERALS International CHEMICALS

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

General Offices: 20 North Wacker Drive, Chicago 6



In the Spotlight this Month

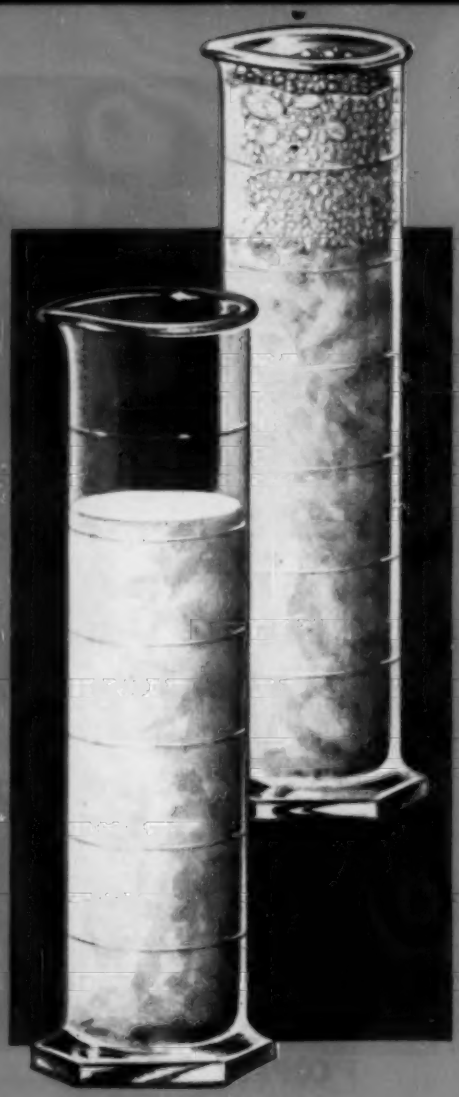
- **High Phosphorus Need?** . . . Dr. Sauchelli explains to the layman why fertilizers need to have a phosphorus "hump." Basic problem is the fixation of phosphoric acid in the soil. Page 59.
- **'57 Recommendations** . . . Systox for beans, Phosdrin for cabbage worms, dormant oil out of oil spray program for '57, in recommendations at Ohio Pesticide School. Page 45.
- **Elements vs Oxides** . . . Change in fertilizer labeling basis called impractical by G. H. Kingsbury, who cites problems for manufacturers, agronomists, distributors, consumers. Page 44.
- **The Pesticide Picture** . . . Pesticide sales on basic manufacturer level up 25 per cent over 1955. Pesticide carry-overs also up substantially. Page 46.
- **Materials Handling Costs** . . . Sewn open mouth bags packaging fertilizers offer greater economy, higher speed of production, and a sure closure. Page 36.
- **Missouri's New Plant** . . . A tour of high analysis pelletizing fertilizer plant at Joplin. With an annual capacity of 70,000 tons, it produces phosphoric acid, ammonium phosphates, and ammonium sulfate. Page 38.
- **Boll Weevil Resistance** . . . Arsenicals and parathion again recommended for 1957 control of cotton boll weevil and bollworm. Problem discussed at Cotton Production Conference. Page 48.
- **Granulation and Ammoniation** . . . Low cost of raw materials in nitric phosphate process is counter balanced by need for expensive equipment. Page 30.
- **Parathion, Rotenone for '57** . . . New Jersey pesticide dealers are advised to recommend parathion for red spider mite, rotenone for asparagus beetles, calcium, lead arsenate, or DDT dust against beetles on seedlings and brush. Page 83.

End Foam

IN YOUR AGRICULTURAL EMULSIONS!

with the **TOXIMUL Emulsifier Twins**

TOXIMUL H...TOXIMUL L



Troublesome foam-over in spray rigs and airplane tanks can now be eliminated by the use of this new pair of *TOXIMUL* emulsifiers, either separately or blended together.

Particularly when using kerosene or xylene-type solvents, *TOXIMUL* H and *TOXIMUL* L impart unusual spontaneity and stability to emulsions—*without foam*—thus giving your product important sales advantages.

TOXIMUL H is used by itself with Toxaphene and Chlordane, *TOXIMUL* L with Dieldrin. By blending the two, excellent emulsification of DDT, BHC, Aldrin, Endrin and Heptachlor is obtained over a wide range of water hardness.

Since 1951, the *TOXIMULS* have steadily grown in popularity among leading insecticide formulators, because of their combination of high efficiency and low cost. These new *"TOXIMUL Twins"* represent one more forward step in better, more practical insecticide formulation. Get all the facts about them without delay.

ALSO:

***TOXIMUL* P**—specifically developed as an efficient emulsifier for Parathion.

***TOXIMUL* MP**—a highly effective emulsifier especially designed for use in Malathion formulations.

***TOXIMUL* 250**—for emulsifying Pentachlorophenol and CIPC.

NINOL Detergents—Emulsifiers

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SEND THIS COUPON NOW!

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Gentlemen: Please send working samples of and complete information about the *TOXIMULS* checked:

- ☐ H & L—for Xylene and Kerosene formulations
- ☐ P—for Parathion formulations
- ☐ MP—for Malathion formulations
- ☐ 250—for Pentachlorophenol and CIPC formulations

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YOU are assured a *consistent* basic source of quality materials.

YOU cut costs with combined carloads from one *basic* source.

YOU can save money, time, plant space and effort through the use of our custom formula mineral mixture service.

WE back up our products with service, research and technical assistance.

Over 30 years experience in nutritional trace element manufacture, research and application to mixed fertilizers

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For further information please make requests on your company's letterhead.

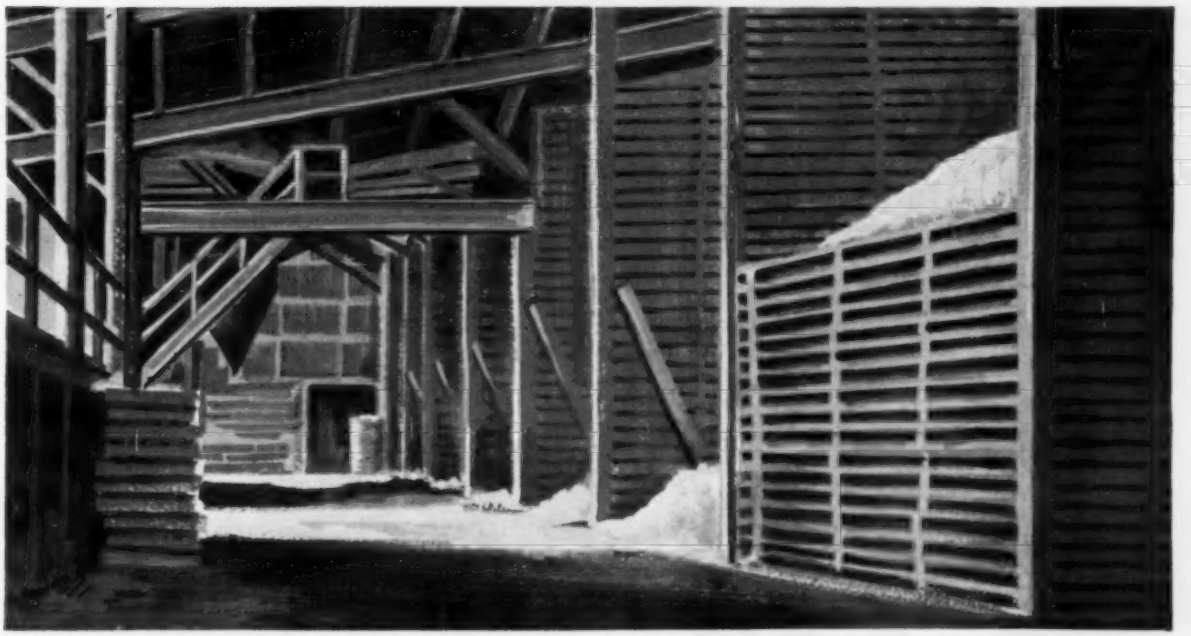
TENNESSEE CORPORATION

617-629 Grant Building, Atlanta, Georgia

Make sure it stores till spring

This time of the year, when you're busy moving inventory to warehouses or dealers, ask yourself this question:

"Have I done everything possible to make sure my mixed goods will store until spring?"



Consider ammoniation solutions. The type you use can improve the condition of your product and its storing qualities. Curing can be improved and bag set eliminated by your choice of solution.

Here's where the *complete* line of Sohiogen solutions can help with its wide choice of characteristics for better manufacturing control . . . plus special solutions with the condition-improving benefits of urea nitrogen.

The man from Sohio is trained to help you select the exact solution to best fit your needs. And Sohio's technical services are available whenever you need them.

We're serious about service at Sohio.

SOHIO®

SOHIO CHEMICAL COMPANY

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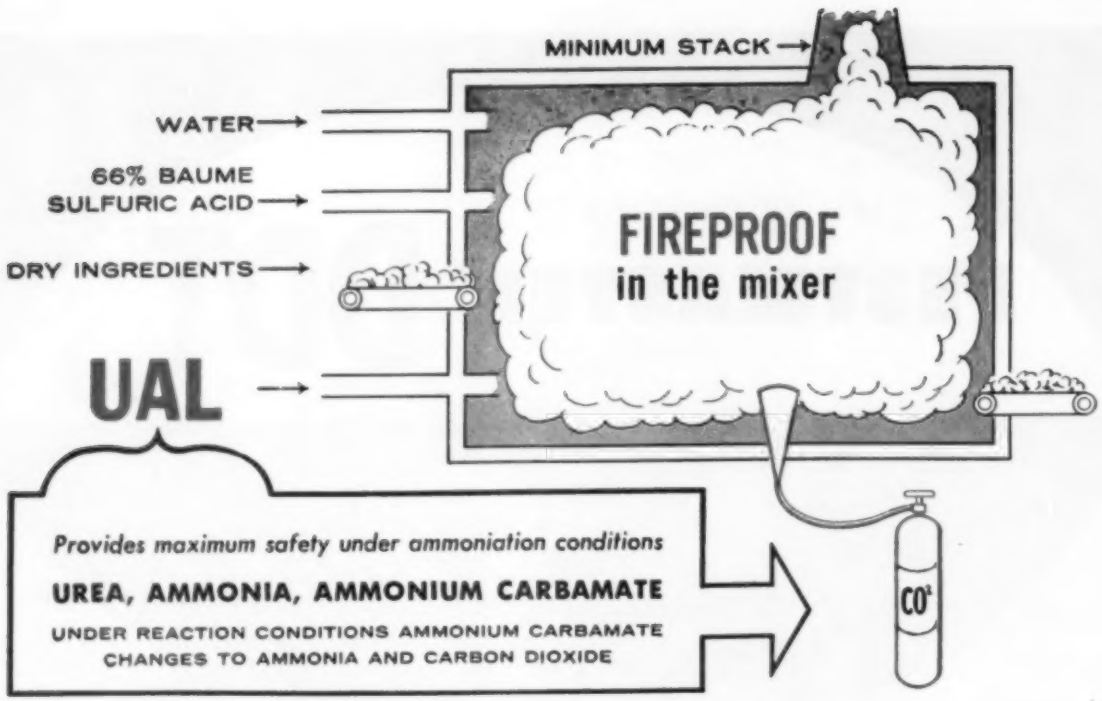

Granulating is fireproof with Du Pont URAMON® Ammonia Liquors

Du Pont "Uramon" Ammonia Liquors give you maximum safety in high-temperature granulating by eliminating dangerous flash fires in the mixer; and, further, by assuring safety in the pile.

Fireproof conditions are maintained in the mixer when Du Pont UAL is used. As the ammoniation proceeds, the ammonium carbamate in UAL changes to ammonia and carbon dioxide. Ammonia enters the reaction and carbon dioxide displaces the air, thus creating conditions that guard against combustion.

Four formulations are available . . . all are equally safe for granulating. For technical assistance and information on the solution best suited to your use, write Du Pont.

HERE ARE OTHER IMPORTANT ADVANTAGES OF DU PONT URAMON® AMMONIA LIQUORS:

- High-quality nitrogen from UAL resists leaching . . . supplies both urea and ammonium forms of nitrogen.
- Won't corrode regular fertilizer manufacturing equipment, including ordinary steel and aluminum.
- Gives mixed goods better "feel"—minimizes caking, segregation and dusting.
- Suitable for either batch or continuous mixing.
- Prompt, dependable delivery enables you to schedule your production with confidence.

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URAMON®
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BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

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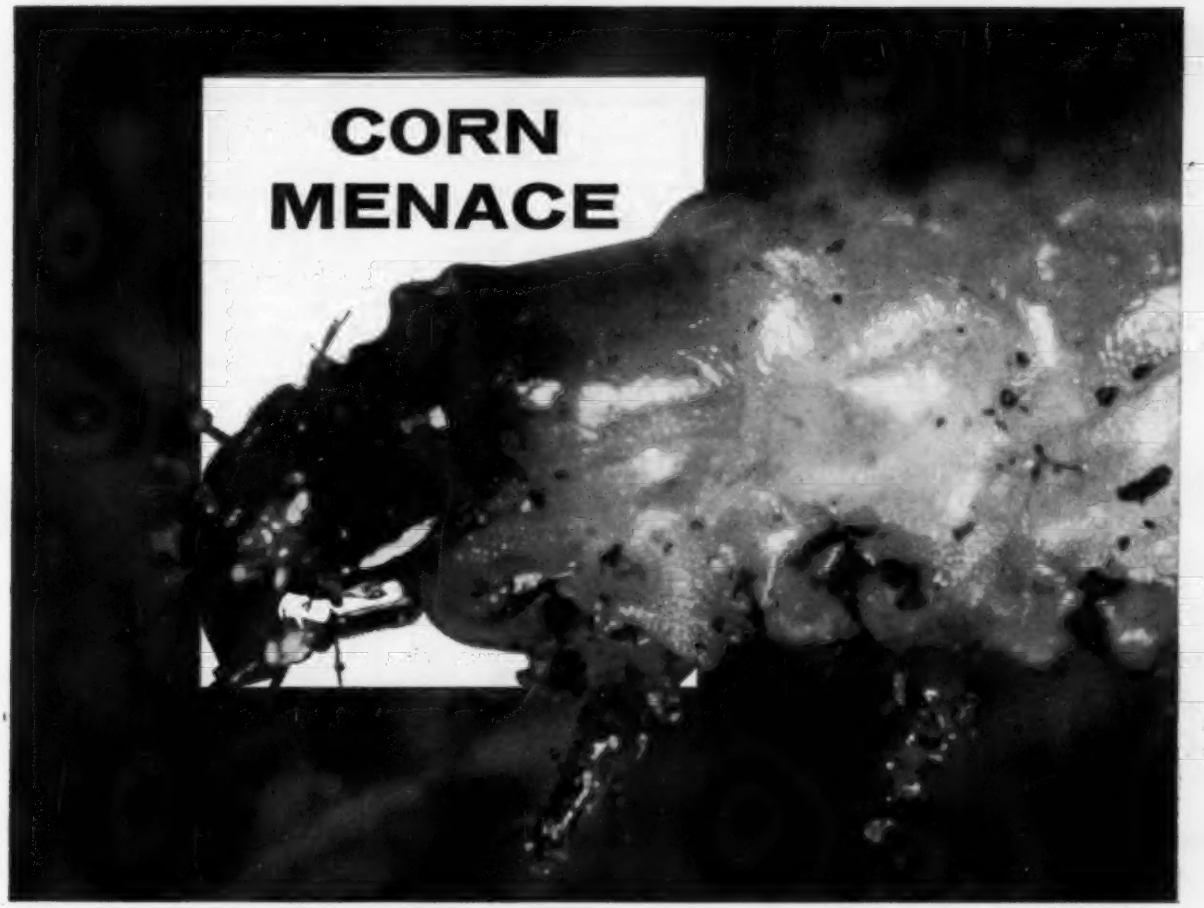


Corn rootworm (magnified 120 times).

aldrin gets soil pests

Every year the use of aldrin for soil pest control grows and grows. The reason: mere ounces per acre of this powerful insecticide effectively control rootworms, wireworms, white grubs and other harmful soil pests. Whenever soil pests attack—you can recommend aldrin with confidence!

Aldrin kills soil pests whether they touch, taste, or breathe it. Healthy root systems develop unmolested. Corn plants receive all the vital nutrients so necessary for vigorous growth. And healthy root systems prevent lodging for bigger and better profit-making yields.

Aldrin is easy to use. It can be broadcast as a spray or dust—or included in a fertilizer mix. Any way it is used, it gives effective, economical soil pest control.

To help achieve the most effective aldrin formulations, Shell provides the finest in technical service—and field representatives who work with growers, county agents and entomologists. For latest technical information, write to:

SHELL CHEMICAL CORPORATION

AGRICULTURAL CHEMICAL SALES DIVISION

460 PARK AVENUE, NEW YORK 22, NEW YORK

SHELL

MEETING CALENDAR

Jan. 8-9 — Texas Fertilizer Conference, Texas A&M, College Station, Texas

Jan. 9-10—Wisconsin Insect Control Conference, the Loraine Hotel, Madison, Wisc.

Jan. 10-11—Mississippi Insect Control Conf., Mississippi State College, State College, Miss.

Jan. 10-11 — North Carolina Pesticide School, N. C. State College, College Union Bldg., Raleigh.

Jan. 10-12 — Northeastern Weed Control Conference, Sheraton-McAlpin Hotel, New York.

Jan. 13-15 — Garden Supply Show, Kingsbridge Armory, New York.

Jan. 16-17—Shell Nematology Workshop, Biltmore Hotel, New York City.

Jan. 21-25—Pacific Northwest Vegetable Insect Conference, and Northwest Cooperative Spray Project, Imperial Hotel, Portland, Ore.

Jan. 22-24 — California Weed Conference, Fresno Memorial Auditorium, Fresno, Calif.

Jan. 23-25 — Southern Weed Conf., Bon Aire Hotel, Augusta, Georgia.

Jan. 23-25—Pacific Northwest Agricultural Chemicals Industry, Benson Hotel, Portland, Ore.

Jan. 24-25 — Custom Spray Operator's School, University of Illinois, Illini Union, Urbana, Illinois.

Jan. 25 — Colorado Agricultural Chemicals Association, Cosmopolitan Hotel, Denver, Colo.

Jan. 28-Feb. 1—Pest Control Operator's Conf., Purdue University, Lafayette, Ind.

Feb. 4-6 — Cotton States Branch, Entomological Society of America, Birmingham, Ala.

Feb. 14-15 — Midwinter joint meeting of fertilizer manufacturers and the state college agronomists, Edgewater Beach Hotel, Chicago.

Feb. 17-19 — National Garden Supply Show, New York Coliseum, New York City.

Feb. 19-20—Alabama Pest Control Conference, and Alabama Association for Control of Economic Pests, Auburn, Alabama.

Mar. 5-6 — Western Cotton Production Conference, Hotel Westward Ho, Phoenix, Arizona

Mar. 6-8 — National Agricultural Chemicals Association, Fairmont Hotel, San Francisco

Mar. 11-12 — Southwestern ESA, Gunter Hotel, San Antonio, Tex.

Mar. 27-29 — North Central Branch, Entomological Society of America, 12th annual meeting, Des Moines, Iowa.

June 9-12 — National Plant Food Institute, The Greenbrier, White Sulphur Springs, W. Virginia

June 17-19 — Association of Southern Feed and Fertilizer Control Officials, 15th annual convention, Dinkler-Tutwiler Hotel, Birmingham, Alabama.

YOU SELL RESULTS WHEN YOU SELL

NON-ACID FORMING NITROGEN FERTILIZERS

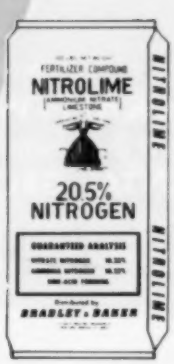
CHECK THESE RESULTS	NITROLIME	CAL-NITRO
DOUBLE SMALL GRAIN YIELD	YES	YES
100-BUSHEL CORN	YES	YES
TWO-BALE COTTON	YES	YES
GROW 10-CENT BEEF (through green winter pastures)	YES	YES

You can offer your customers *positive* programs for increased crop yields when you sell them the leading *non-acid forming* nitrogen fertilizers—Nitrolime and Cal-Nitro.

Perfectly balanced with half nitrate nitrogen and half ammonia nitrogen to give both fast action and resistance to leaching, Cal-Nitro and Nitrolime are your customers' best assurance of effective plant feeding.

And they are your best assurance of increased volume and profits. These superior nitrogen compounds sell better on every point—they come in handy free-flowing granular form for easy hand or machine application, are always uniform in quality and completely dependable.

Ask your Bradley & Baker representative how you can profit from Cal-Nitro and Nitrolime by profiting your customers.



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There is a Standard Oil office in every major marketing area in fifteen Midwest and Rocky Mountain states. Experienced representatives are located in each of these offices to help you with the purchase of NH_3, Aqua Ammonia and Nitrogen Solutions.

Perhaps one of these men is already calling on your plant providing technical service on Standard Oil petroleum products. He knows your methods of ordering and warehousing and your delivery requirements. He will handle your orders for Ammonia and Nitrogen Solutions and give you the kind of service on these products that you have become accustomed to receiving from Standard.

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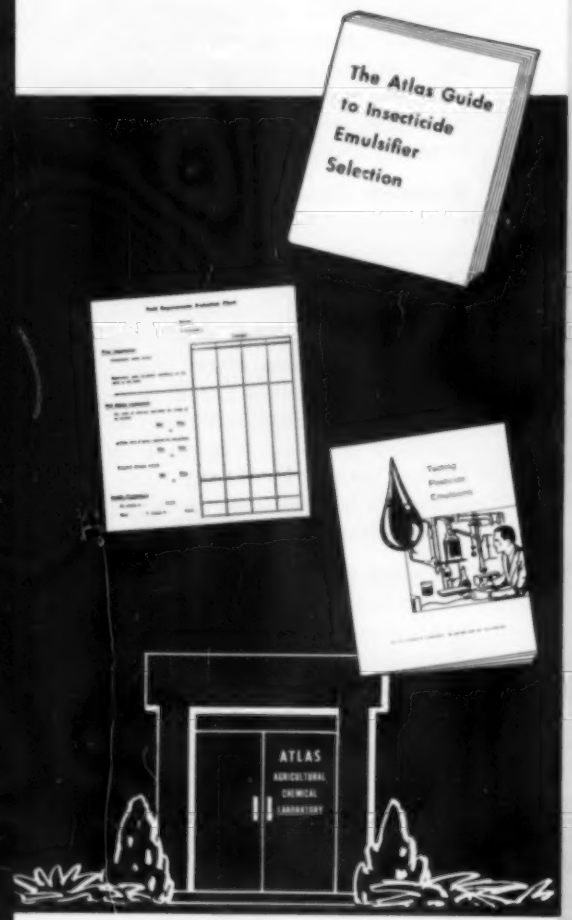
For more information about Nitrogen Products ask your Standard representative. Call the nearby Standard Oil office or write Standard Oil Company, 910 South Michigan Ave., Chicago 80, Illinois.

STANDARD OIL COMPANY
(Indiana)

you can *cut formulating time* with the Four ATLOX formulating tools



The complete, integrated ATLOX set of tools saves you days of lab work in choosing and using emulsifiers for all your chlorinated hydrocarbon insecticides and commonly used solvents. They help you to—

- **match field requirements**
- **sell all hard and soft water markets**
- **reduce emulsifier inventories**
- **improve your quality control**
- **keep production flexible to meet emergency infestation orders**
- **reduce solvent costs**

1 Atlas Guide to Insecticide Emulsifier Selection has four-color charts and laboratory reports that steer you to best performance in each formula or to a blend that works well in all formulas. You can adjust for mixed solvents, for changes in solvents, for varying field dilutions, for various water hardnesses, for toxicants that you may add to your line.

Because the Guide is useful only to volume formulators of chlorinated hydrocarbon insecticides for agricultural use, it will be presented personally by an Atlas representative to those who request it on their company letterhead.

2 Field Evaluation Charts . . . a guide and check list for the chemist, of field use conditions and desired performance. Available in pads.

3 Suggested Test Methods, developed by Atlas and adaptable to your needs, help make formulation easier, less tedious, faster and more accurate. A movie, "Pesticidal Emulsion Testing," a booklet, and reprints of technical articles are available.

4 Formulation Service by the Atlas laboratories, among the largest and best equipped in the industry, gives you valuable help on special problems.

NEW ATLOX Emulsifiers

ATLOX 4500 and 4600 emulsifiers are based on a chemical material not previously used in agricultural chemicals. They are not sensitive to variations in in-plant blending, or to slight changes in solvents. They perform well at all dilution rates and water hardnesses. You can use them singly, or blend them to custom-fit formulas. Use them in connection with the four ATLOX tools. Samples upon request.

CHEMICALS DIVISION
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POTASH RAISES FARM INCOME. The successful American orange grower. He's not shy about his success. He'll tell you the importance of frost prevention and the newest insect sprays. He'll probably talk well-balanced fertilizers and potash content, too. And he's the one to talk—grows the biggest, juiciest oranges around! His land isn't better than anyone else's. He treats it better, that's all.

USP's high-grade muriate of potash is free-flowing and non-caking and has the highest K_2O content—62/63% K_2O. Also available, USP's granular muriate of potash contains a minimum of 60% K_2O.

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new source of high quality lime
...quicklime and hydrate
West End, supplier of quality chemicals for over 31 years, proudly announces expansion of its hydrate and quicklime production. Discovery of an extensive deposit of high grade limerock resulted in the construction of a large new processing plant. The photo shown here is of the giant 340 foot rotary kiln. The plant will soon be producing increased quantities of highest quality lime to serve the needs of growing western industry. We suggest you give consideration to West End as a primary source of supply. Inquiries and your specifications are invited.
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West End Chemical Company
DIVISION OF STAUFFER CHEMICAL COMPANY
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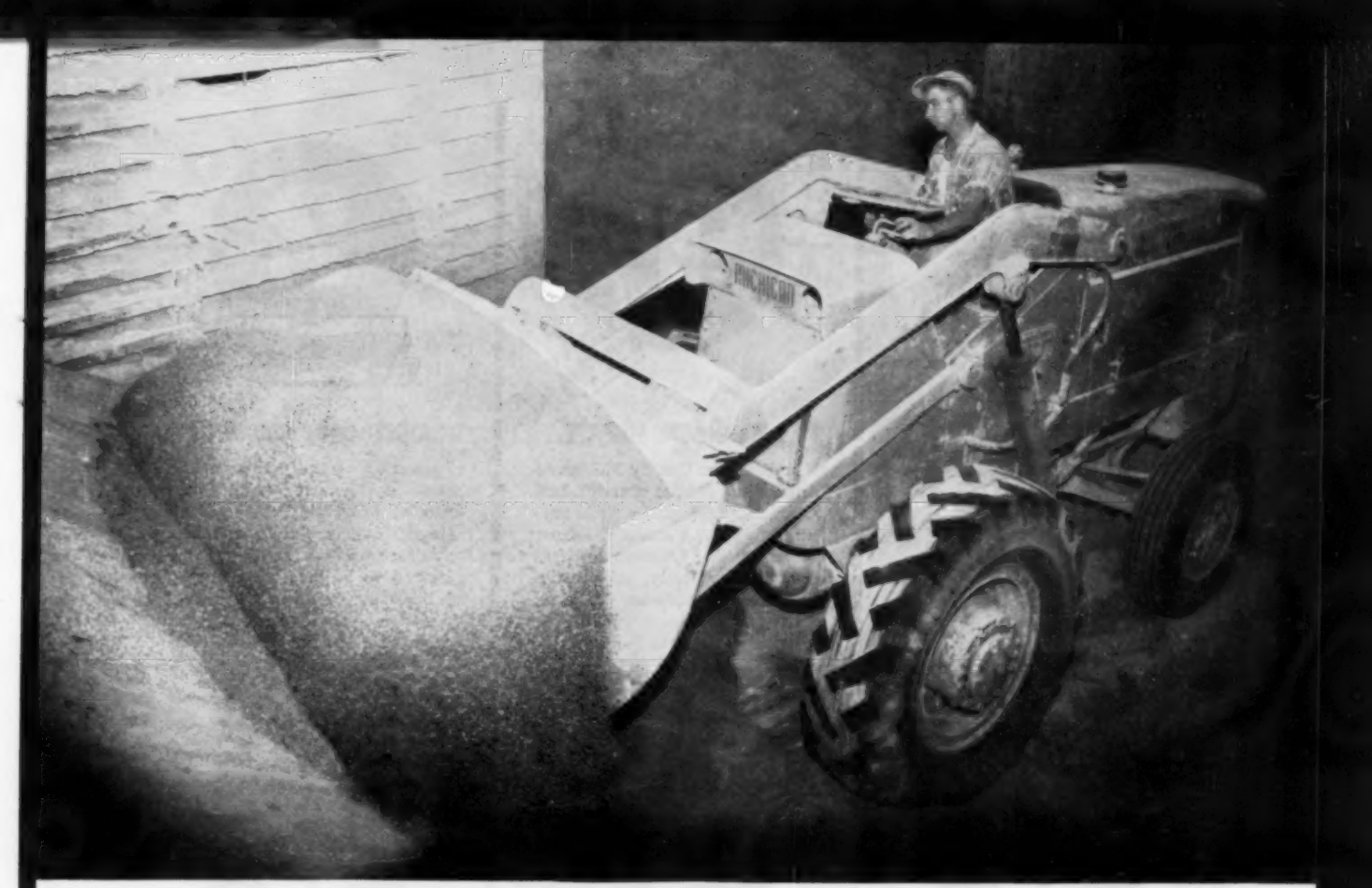
SODA ASH • BORAX • SODIUM SULFATE • SALT CAKE • HYDRATED LIME



Dust a problem in your material handling?

Here's how Michigan Tractor Shovels help Swift & Company

Swift & Company's plant food division at Madison, Wisconsin has the usual problem encountered in the processing of raw materials such as potash and superphosphate, and in handling the finished plant foods.

Equipment used in these processes is exposed to long hours of continuous maneuvering while handling the bulk materials. Equipment must be durable to withstand the heavy loads, quick stops, and grit of raw material acting on the machine. Swift officials report the one-yard 77 hp Michigan Model 75B shown has given excellent results in meeting these requirements.

Moving potash 110 ft from bin to mixer, Michigan is timed delivering 60 loads (97,200 lbs) per hour. Unit changes direction and speed at flick of power-shift lever. No clutching needed.

Works round-the-clock

"It is dependable," says Madison Assistant Superintendent Harry Peeler. "It worked round-the-clock during our latest two-month rush season. Its only stops were to add fuel, inspect oil, and change operators. We've had no troubles with grit in the power-train . . . and no axle failures."

Ken Kremelling, veteran tractor shovel operator, says, "Michigan's torque converter helps you heap big loads fast. Low bucket-carry helps you keep what you load. Power steer takes you around turns fast. And power shift helps you start back for the next load fast."

See Michigan advantages for yourself

A trial in your plant will show you how these same advantages can pay off for you. Write for details on the size Michigan that interests you—6, 10, 15, 20 or 27 cubic feet; 1, 1½, 1⅝ or 2¼ cubic yards.

Michigan is a registered trade-mark of

CLARK EQUIPMENT COMPANY
Construction Machinery Division
2463 Pipestone Road
Benton Harbor 7, Michigan

CLARK® EQUIPMENT

5 PHILLIPS

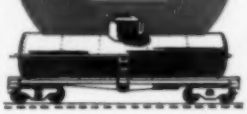
Fertilizer Materials for High Analysis Mixtures

1

AMMONIUM SULFATE

New Premium Quality Phillips *66* Ammonium Sulfate contains 21% nitrogen, 23.8% sulfur. It is *dry*-cured to remove excess moisture, prevent caking. Uniform dust-free crystals flow freely, mix easily. Ideal for all analyses of mixed goods and for direct application. Available in bags or bulk.

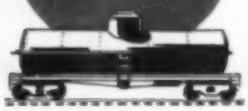
2



ANHYDROUS AMMONIA

Phillips *66* Agricultural Ammonia contains 82% nitrogen. It's a convenient, economical source of nitrogen for formulation of mixed goods. Tank car shipments are assured to Phillips contract customers by Phillips huge production facilities in the Texas Panhandle and at Adams Terminal near Houston.

3



NITROGEN SOLUTIONS

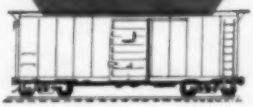
Get more N per dollar! There are three Phillips *66* Nitrogen Solutions for use in preparation of high-analysis fertilizers and the ammoniation of superphosphate. These solutions help to keep manufacturing costs low; help rapid, thorough curing.

4

AMMONIUM NITRATE

Phillips *66* Prilled Ammonium Nitrate contains 33.5% nitrogen. The small, coated prills resist caking, handle easily. Depend on Phillips *66* Prilled Ammonium Nitrate for uniform free-flowing properties and top-notch crop response as a direct application material. It's an ideal companion high nitrogen fertilizer for your quality mixed goods.

5



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Editorial COMMENTS

PESTICIDE sales totals for the year 1956, just released by the National Agricultural Chemicals Association, confirm that the year was an exceptionally good one, sales-wise, for basic producers of insecticides. Sales reached a total of $250,000,000, an increase of $50,000,000 over the figure for the previous year, and a new all-time high for the industry.

Contributing to the big sales total were the following factors: heavier insect infestations generally throughout the U. S.; the strenuous campaign to stamp out the Mediterranean Fruit Fly in the Florida citrus belt; the spread of the spotted alfalfa infestation in the southwest; increased use of pesticides throughout the world to protect the public health; and higher prices on pesticides in the export market, with a minimum of the distress selling that had characterized such sales in previous seasons. Pesticide production was apparently at an even higher level than were sales in the '56 season, for USDA figures on carryover of pesticides (as of Sept. 30, 1956) show that stocks on that date were up somewhere between fifty and seventy-five percent as compared with the previous year. Producers' stocks of the chlorinated hydrocarbon group were up ninety percent from the previous year, DDT stocks were up 78% and BHC up 100%. Stocks of basic pesticides in the hands of formulators were also substantially higher than on the same date in the previous year, although not quite as high percentagewise as stocks remaining in producers' hands.

What is needed to complete the picture, of course, is a report on what unsold stocks of pesticides still remain on the dealers' shelves. Unfortunately such figures are almost impossible to obtain with any degree of accuracy, and even the preparation of any reasonable estimate seems to be impractical. The general feeling in the trade, however, so far as we have been able to gauge it, is that dealer stocks must be quite heavy. The 1956 consuming season was shut off so abruptly in so many sections of the country that it would be reasonable to assume a rather heavy shelf stock remaining in dealers' hands.

Unfortunately for the pesticide industry this is a rather unique market in which a sale is not really a sale until the goods have finally reached end use. Regardless of whether or not consignment stocks come back to the formulator, or even to the basic producer, there can't be any substantial new sales in the new year until the previous year's production has actually been used up. With producers' and formulators' stocks high, and since stocks in the hands of dealers must be presumed to be high until demonstrated otherwise, this would seem to be a year when a repetition of last season's record production could really flood the market.

Many in the trade apparently feel, however, that in the normal course of things 1957 business can be expected to be good. They point to the fact that insect infestations run in cycles, and that '57 may continue the upward trend in pest populations which got under way last season. Certainly the industry should be well prepared to handle record demand for insecticides, to judge from the well stocked carryover position and the capacity to produce so well demonstrated last season.

the Changing Technology of Granulation and Ammoniation

THE development of the TVA continuous ammoniator has been described by Yates, Nielsson, and Hicks *(14)*. Pilot-plant studies of the use of the continuous ammoniator with auxiliary equipment to produce granular, high-analysis fertilizers were described by Hein, Hicks, Silverberg, and Seatz *(2)*. Subsequent papers reported the results of further pilot-plant work on producing granular fertilizers using diammonium phosphate *(4)*, calcium metaphosphate *(11)*, and urea-containing ammoniating solutions and solid urea *(10)*.

These previous papers have shown that granular fertilizers can be made from a large variety of formulations and raw materials by using the TVA continuous ammoniator and accessory equipment. This report deals with new combinations of raw materials and methods that are currently being studied in the continuous ammoniator pilot plant, and with other new information pertinent to ammoniation and granulation.

Ammonium Phosphate-Nitrate and Ammonium Phosphate-Urea

ONE current project is the production of granular, high-analysis fertilizers from phosphoric acid and ammoniating solution. The fertilizer products made from these materials contain ammonium phosphate and either ammonium nitrate or urea, depending on the composition of the ammoniating solution. The advantages of the process are (1) unusually high analysis of the products and (2) high water solubility. Estimates show that the process is economically quite attractive when phosphoric acid is available at a favorably low price.

Several methods of carrying out the reaction between ammoniating solution and phosphoric acid and of granulating the product were studied in the laboratory. The continuous ammoniator method was selected for pilot-plant development. One advantage of this method is that the equipment in many granulation plants could be adapted to use this method.

The pilot plant was the same as that described previously *(2)* with a few modifications, which are mentioned later. Ammoniating solution and phosphoric acid were fed into the ammoniator through appropriate distribution. Potassium chloride, if desired, and recycle were fed through volumetric feeders. Granulation was controlled by the proportion of recycle. The amount of recycle required varied from about 50 to 75% of the throughput, depending on the grade. When electric-furnace phosphoric acid was used, some grades were not sufficiently plastic to granulate properly. This difficulty was overcome by premixing some phosphate rock with the phosphoric acid. The amounts of phosphate rock used were such as to supply 5 to 10% of the P_2O_5 content of the product; 5% was sufficient for satisfactory granulation. Similar improvement in granulation was obtained by adding enough concentrated superphosphate to supply 15% of the P_2O_5. The concentrated superphosphate was added along with the other dry raw materials. The availability of the P_2O_5 in the product was the same (about 99%) when using the phosphate rock—acid mixture as when using separate addition of concentrated superphosphate.

When wet-process phosphoric acid was used, it was not necessary to add phosphate rock or superphosphate to ensure satisfactory granulation. However, it might be economically advantageous to do so in making some grades.

When phosphoric acid was used without phosphate rock addition, the acid was distributed under the bed in the ammoniator through a drilled pipe adjacent to the ammonia distributor. The acid distributor was the same length as the ammonia distributor and was drilled to give the same distribution pattern. When phosphate rock was premixed with the acid, the mixture could not be fed through a drilled pipe; it was distributed on the surface of the bed through an open-end pipe which was moved back and forth across the length of the bed by a mechanical device at a rate of 30 passes per minute.

The granular product leaving the ammoniator contained 3 to 6% mois-

T. P. Hignett
Tennessee Valley Authority
Wilson Dam, Alabama

Experimental Pan Granulator

ture. It was dried in the rotary dryer to less than 1% moisture. The dried product was cooled and screened to separate plus 6-mesh material as oversize and minus 12, 20, or 28 mesh as undersize. The undersize and crushed oversize were recycled to the ammoniator. Usually the amount of oversize and undersize was less than the recycle requirement, so it was necessary to crush some of the onsize product to get enough recycle.

Bag-storage tests of 6 months' duration were made with some of the products. When the products had been dried to less than 1% moisture, cured for a few days, and conditioned with 2% kaolin, no caking and little or no bag set occurred. Bulk-storage tests of conditioned 16-22-16 product were made in which a few tons were held in an open bin in a well-ventilated building throughout the summer. No caking or deterioration in physical properties was observed.

Data for typical pilot-plant tests for production of 15-30-15, 16-22-16, and 16-48-0 are shown in Table I. Other grades that have been made in the pilot plant include 17-17-17, 11-22-22, and 7-28-28. A small proportion of sulfuric acid was used in addition to phosphoric acid in making 17-17-17.

TABLE I

Ammonium Phosphate-Nitrate and Ammonium Phosphate-Urea

	15-30-15	16-22-16	16-48-0
Formulation, lb./ton			
Nitrogen solution	630[a]	967[b]	334[c]
Anhydrous ammonia	—	—	220
Ammonium sulfate	100	—	—
Concentrated superphosphate	180	—	316
Phosphoric acid (80% H_3PO_4)	915	780	1410
Potassium chloride	500	557	—
Recycle, % of throughput	48	74	80
Moisture content, %			
From ammoniator	6.6	3.6	4.2
From dryer	0.8	0.8	0.7
Temp., ammoniator product, °F.	170	149	101
Granulation, %			
Oversize	42	23	21
Onsize	51	62	56
Undersize	7	15	23

[a] Ammonia—urea—amonium carbamate solution (UAL-B).
[b] Ammonia—ammonium nitrate solution (Spensol C).
[c] Ammonia—ammonium nitrate solution (Spensol A).

Nitric Phosphate

TVA has developed several nitric phosphate processes through the pilot-plant stage. The results of this

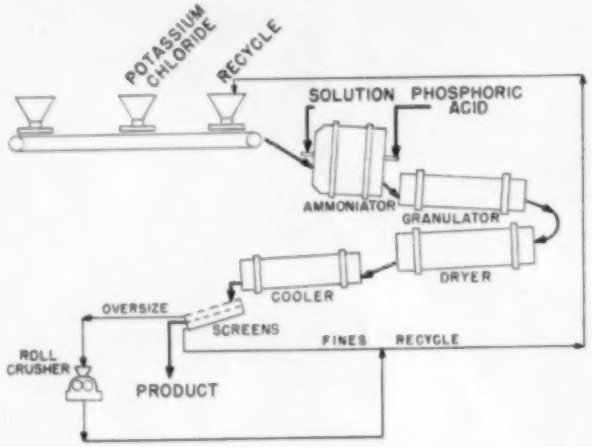


Figure 1

FLOW DIAGRAM OF TVA PILOT PLANT FOR PRODUCTION OF AMMONIUM PHOSPHATE-NITRATE

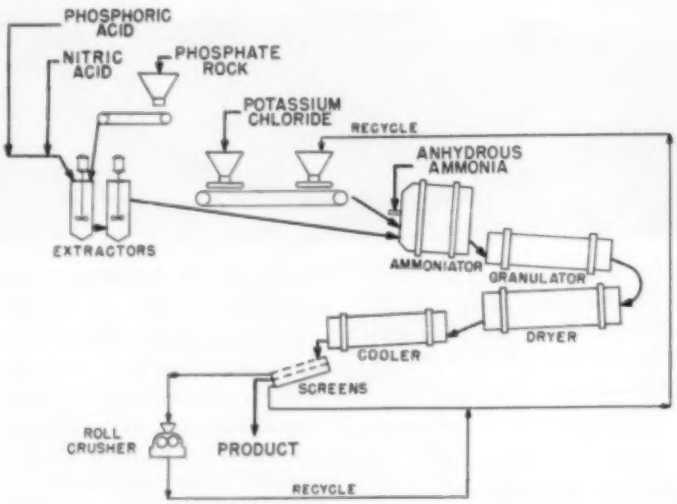


Figure 2

MODIFIED NITRIC PHOSPHATE PROCESS

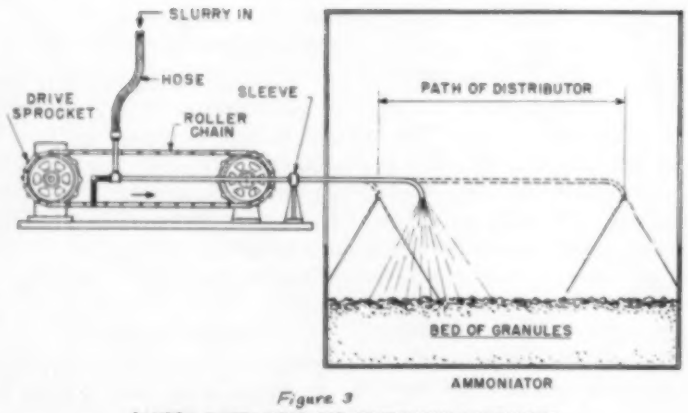


Figure 3

SLURRY DISTRIBUTOR FOR CONTINUOUS AMMONIATOR

work have been published *(3, 5, 7, 8, 9, 13)*. Also, similar processes are used in Europe. The fertilizer industry showed considerable interest in the nitric phosphate processes a few years ago during the sulfur shortage. Less interest has been shown since the sulfur supply has become adequate. Only two nitric phosphate plants were built, and one is now under construction.

One of the main advantages of the nitric phosphate process is the low cost of raw materials, which may be 20 to 30% less than that of similar grades of fertilizers made by conventional processes *(12)*.

In explaining the fertilizer industry's reluctance to adopt the nitric phosphate processes, the following disadvantages have been pointed out: (1) the equipment required is much more expensive than that used in the usual fertilizer manufacturing plant, (2) entirely new plants would be required, since little use could be made of existing plants, and (3) the nitric phosphate processes are not adaptable to the manufacture of as large a variety of grades as most manufacturers deem necessary, and the equipment is not adaptable to make use of other processes.

Recently, however, exploratory tests made in the TVA continuous ammoniator plant showed that this equipment can be used instead of the slurry-tpe ammoniation and granulation steps of the original process. Use of the TVA ammoniation-granulation method would eliminate most of the disadvantages of the nitric phosphate processes. The equipment cost would be reduced by 50% or more, and operating costs would be decreased. Many existing granulation plants could be adapted to use the nitric phosphate process by addition of a relatively inexpensive acidulation unit and other minor changes. The equipment would be versatile enough that it could be used alternately for nitric phosphate and conventional processes.

In the exploratory tests, phosphate rock was acidulated with nitric and phosphoric acid. The acidulation was carried out batchwise in two stainless steel tanks. A continuous acidulation system will be used in fur-

ther tests. The acidulated slurry was distributed on the surface of the bed of material in the continuous ammoniator from an open-end pipe, which moved back and forth across the length of the bed at a rate of 30 passes per minute. Potassium chloride and recycle were fed to the ammoniator through the usual dry feeders. Anhydrous ammonia, in gaseous form, was fed under the bed through a distributor similar to that used in previous work for ammoniation of superphosphates. The ammonia was used in gaseous form to increase the heat of reaction and thereby assist in evaporating water.

Table II shows data for a pilot-plant test in which a 14-14-14 nitric phosphate fertilizer was produced using nitric and phosphoric acids for acidulation. Operation of the pilot plant was very good. Ammonia recovery was satisfactory. Availability of P_2O_5 in the product was 98%. Granulation was controlled by the amount of recycle. About 82% of the product had to be recycled to control granulation. This amount of recycle was high because (1) the nitric acid concentration was low (51% HNO_3) so an excessive amount of water was introduced with the acid and (2) the pilot-plant facilities were not adequate for crushing the recycled products and, consequently, much of it was recycled without crushing.

14-14-14 Data

Oversize (+6 mesh)	43
Onsize (—6 +20 mesh)	50
Undersize (—20 mesh)	7

TABLE II

Data for Production of Nitric Phosphate Fertilizer (14-14-14) in Continuous Ammoniator Pilot Plant

Formulation, lb./ton	
Phosphate rock	481
Phosphoric acid (75% H_3PO_4)	241
Nitric acid (51.7% HNO_3)	1222
Ammonia	176
Potassium chloride	509
Recycle, % of throughput	82
Temp., ammoniator product, °F.	154
Moisture content, %	
Ammoniator product	3.3
Dried product	0.9
P_2O_5 availability, %	98

TABLE III

Pilot-Plant Data for No-Nitrogen Grades Using Phosphate Rock

Grade	0-14-14	0-14-14	0-20-20	0-26-26	0-48-0
Formulation, lb/ton product					
Phosphate rock	438	888	420	163	266
Concentrated superphosphate	—	—	574	771	1432
Ordinary superphosphate	720	—	—	—	—
Sulfuric acid (94% H_2SO_4)	326	613	281	—	—
Phosphoric acid (78% H_3PO_4)	—	—	—	148	309
Potassium chloride	466	452	657	888	—
Water	150	140	100	—	—
Steam	—	—	50	125	360
Recycle, % of total feed	—	48	—	8	21
Temp., ammoniator product, °F.	148	162	162	157	187
Onsize recovery after crushing, %	89	72	87	84	88
Moisture content of product, %	6.0	4.1	3.7	4.3	4.4
Net conversion of P_2O_5 in rock,[a] %	95	94	98	92	98

[a] After 1 to 7 days of curing.

The granulation efficiency was good; about 50% of the product was in the 6- to 20-mesh size range. The granules were round and hard. The product leaving the ammoniator contained about 3% moisture; it was dried to less than 1% moisture.

It is believed that the amount of recycle can be reduced to about two thirds of the throughput for some formulations. The process should be quite advantageous economically to manufacturers who can adapt their present plants to use it, if they can obtain nitric acid at a reasonable price.

Granular No-Nitrogen Grades

In the granulation of fertilizer grades that contain nitrogen, the reaction of ammonia with superphosphates or acid plays an important part in providing conditions that are favorable to granulation. This reaction is not available as an aid to granulation of no-nitrogen grades. Granular no-nitrogen grades are usually made by granulating superphosphates or mixtures of superphosphates with potash salts. In our first experiments we sought to granulate these materials by using the continuous ammoniator as a rotary granulator. Water or water and steam were added in sufficient quantity to cause granules to form. The granulation efficiency was fairly good, but the granules were not very strong. Also, the high percentage of moisture required for granulation made the drying step difficult and expensive.

(*Continued on Page* 107)

TABLE IV

Granulation of Mixed Fertilizers in a Rotating Pan and in TVA Ammoniator-Granulator

Grade	10-20-20[a]	
Type ammoniator-granulator	Pan	Rotary drum
Granulation, %		
Oversize (+6 mesh)	37	30
Onsize (—6 +28 mesh)	57	69
Undersize (—28 mesh)	6	1
Onsize after crushing oversize, %	85	91
Degree of ammoniation	3.7	3.9
Ammonia loss, %	19.2	2.8
Ammoniator product		
Temperature, °F.	175	197
Moisture, %	3.8	2.9

[a] Raw materials: Nitrogen solution (21.7% NH_3, 65% NH_4NO_3), concentrated superphosphate, potassium chloride, and sulfuric acid.

SAFETY

IN his struggle for extermination of the insect pests, man has devised an increasing number of chemical weapons. Most of these are relatively recent developments, having appeared since World War II. As they have attained a greater degree of complexity and extent of use, they have created potential health hazards that are unique, not in the sense that they are new, but in the sheer breadth of their scope. The growing attention paid to these matters by the daily press and periodicals is causing greater awareness and concern on the part of the general public. Some of this publicity has been ill-conceived and inaccurate and has led to a corresponding degree of confusion in the public mind as to the safety of these materials. In the absence of proper education, this state of affairs could lead to unnecessarily restrictive regulation that would hamper the tremendous contribution to health and economic welfare that pesticides, intelligently used, are capable of making.

Essential to the control of hazard in the use of any chemical are an understanding of the ways in which the substance may injure the body, and a regard for the elementary principles of personal hygiene and self-protection. The preventive measures are basically the same in all instances, i.e., avoidance of skin contact, inhalation and incidental ingestion. However, our understanding of mechanisms of action is complicated by the fact that there are a variety of pesticides available commercially which have differing toxicological properties. The public, in general, has no clear appreciation of the distinction between the several broad classes of insecticides that are in common use today. By now, most people have heard of DDT, but beyond recognition of this name, acquaintance with the general field of pesticides is sharply limited. The present discussion will cover the principal features of one of the more economically important, but still less familiar groups; namely, the organic phosphates.

The organic phosphate insecticides are the outgrowth of a search that was carried out in Germany during World War II for new chemical warfare agents. In the course of preliminary screening of the toxicity of these compounds, a number were found to be lethal to insects at concentrations that were almost unbelievably low. However, high toxicity to insects is only one, albeit an important attribute of a good insecticide; other factors such as low volatility, stability, and safety in manufacture and application must be taken into account. Several compounds having the requisite qualities emerged from this work, of which parathion and TEPP (tetraethylpyrophosphate) were the first to be used on a large scale. Since the introduction of these powerful pesticides, a variety of other organic phosphates have been developed from industrial research both in the United States and other countries. Their unusual effectiveness over a wide range of insect species, coupled with the fact that insects do not develop resistance to them to any significent degree, have earned for them an important position in the field of economic poisons. Most of them, such as parathion and TEPP, are too acutely toxic to be handled by amateurs, and their use should be restricted to specialists in pesticide application. This situation has changed somewhat recently with the introduction of the new phosphate, "Malathion."* This product combines a high degree of insecticidal efficacy with such a remarkably low order of mammalian toxicity that it is permitted in domestic and home-garden use. Its record of safety is outstanding in that despite the millions of pounds of technical material that have been distributed over the past several years, no well-authenticated case of poisoning therefrom has been reported.

Although broad generalizations are always subject to exceptions, the following remarks may be said to apply generally to the organic phosphates of current commercial importance. Despite their identification in the popular mind with "nerve gases," they are not gases but oily liquids. In fact, their volatility is so low that at ordinary temperatures there is not sufficient vapor present in equilibrium with the liquid to constitute a hazard. They are chemically decomposed with varying degrees of rapidity by weathering under conditions of use, so that their residues have little persistence. While this lack of residual character may be of disadvantage for some purposes, it has the merit in the case of agricultural commodities that consumer hazard may be largely eliminated by the simple expedient of allowing a relatively brief period to intervene between the final spraying and harvest. Finally, the most characteristic property of the phosphate insecticides as a class, apart from the presence of the phosphorus atom in their chemical structure, is their capacity to inhibit the action of the enzyme cholinesterase (ChE). Since anticholinesterase activity is the principal, if not the only mechanism by which these substances exert their toxic effects in all except overwhelming exposures, it is necessary for an understanding of their action that we digress briefly into physiology.

With certain well-defined exceptions, the majority of body structures such as glands and muscles are dependent for their proper functioning upon a nerve supply. Nervous control is exerted by impulses which originate centrally and travel along the nerve to the effector organ. In some instances two nerves in tandem are required to span the gap from the brain or spinal cord to the periphery, and in such cases, we may consider the second nerve to be the "effector organ" of the first. All effector organs contain "receptor sites" which are the terminal points in the chain of transmission. The feature of this process which concerns us is the manner in which the impulse

*A product of American Cyanamid Co., New York.

with
PHOSPHATE INSECTICIDES

By C. Boyd Shaffer
American Cyanamid Co.

bridges the gap between the endings of the nerve fiber and the receptor sites in the organ. This is accomplished by the liberation of a small quantity of the chemical compound known as acetylcholine (ACh). Nerves whose impulses are mediated in this way are referred to as "cholinergic," and this term is also used to describe the effects produced by their stimulation. ACh is present in all cholinergic nerve fibers. Obviously, in the resting state of the nerve it must exist in some bound form, but when the fiber is stimulated it appears at the nerve endings in an active and diffusible state. From this point, it is carried by the blood or tissue fluid to the receptor site where it produces the response characteristic of that particular effector organ, e.g., contraction of a muscle or secretion by a gland.

It follows that the body must have a mechanism for disposal of a substance physiologically as potent as ACh, else a single stimulus would induce a persistent state of cholinergic activity. This disposal is effected by the enzyme, cholinesterase, which splits ACh to choline and acetic acid, both of which are relatively inactive. The pathway of removal indicates the means of measuring the activity of the enzyme, since the production of acetic acid forms the basis of most methods of assay.

While phosphate insecticides are readily absorbed by any portal of entry into the body, it is a matter of record that absorption through the intact skin is the most frequent route of exposure in their agricultural use. They are not skin irritants, and since the individual experiences no discomfort from skin contact with them he is not aware that dangerous quantities may be entering his body by this route. The course of intoxication in a hypothetical but typical case is graphically described by Hamblin and Golz (1) in their review of parathion poisoning. Since there is little that can be added to this description, we reproduce it here:

"The patient commonly gives a history of having felt perfectly well when he went to work in the morning. He may and frequently does give a history of having sprayed with parathion repeatedly before. Because insecticide spraying is done mostly in spring and summer, the patient has found it too hot to wear the recommended protective clothing and mask and often states that he worked stripped to the waist or wearing only a T-shirt on the upper part of the body. If he has had some previous experience with parathion, he will probably tell the doctor that he sprayed downwind to avoid the spray drift; but, of course, he could not prevent the liquid from trickling back down the hose onto his hand and forearm and onto his trousers. If he is inexperienced, he will often tell of his clothing having become wet with sweat and spray material. As work continues and the morning wears on, he begins to feel weak and tired and notices a dull headache. He decides that the heat is 'getting him,' and he sits down in the shade to rest and have a cigarette. With the latter, he introduces more parathion into his body via the alimentary tract. He doesn't feel much better after his rest, so he decides to quit for the morning and go to lunch. He may or may not wash up before eating. Lunch is taken without much enthusiasm, for appetite is not very good and the headache, weakness and fatigue are becoming worse. By this time, he has concluded that there is something more wrong with him than heat and sun. He decides to lie down for a while but notices that he feels dizzy and nauseated. Then the balance of the picture develops, often with alarming rapidity. Abdominal cramps set in accompanied by vomiting and diarrhea. There is a feeling of constriction in the throat and chest, and it is becoming an effort to breathe. He notices that he is sweating profusely, and it is becoming difficult to focus his vision. Mental confusion is now evident, and twitching of the voluntary muscles appears. Secretions generally are increased, and excessive salivation is a prominent symptom. The patient is still able to stagger about with difficulty, but he soon collapses. Coma supervenes, accompanied by convulsive seizures, and death is imminent."

Poisoning by phosphate insecticides is essentially an acute episode. The development of signs and symptoms proceeds rapidly after excessive exposure, commencing within the first hour or two, or certainly within the first six hours. In fact, if it can be established that the individual had no contact with these materials within 12 hours preceding the onset of acute symptoms, the illness can usually be ascribed to another cause. The clinical picture of poisoning is usually well-developed within 12 hours, and by the time 24 hours have elapsed since exposure, the patient is either dead or well on the road to recovery.

Fortunately, if the amount of phosphate insecticide absorbed has not been too massive, there exists a specific and unusually effective antidote to counteract it. This is the drug atropine. While atropine does not prevent the accumulation of excess ACh, it does have the property of blocking the action of ACh on the effector organ. The symptoms of excessive cholinergic stimulation are thereby controlled, and what may have other-

(*Continued on Page 99*)

*Presented at Aerial Applicators Conference, 17th Annual Convention, National Aviation Trades Assn., St. Louis, Mo., Nov. 1, 1956.

Packages—Packaging and MATERIALS

OVER the years the packaging of inorganic chemicals and fertilizers has evolved from 200 lb. burlap bag units to the present trend toward 50 lb. paper units. While many manufacturers of fertilizers and chemicals have been aware of the costs of packaging, they have not given the subject the attention it deserves until recent years.

As in all industries lately, more attention is currently being given by fertilizer manufacturers to reducing costs and increasing production. Recent low profit margins realized in this industry have brought all costs sharply into focus. Manufacturers have made great strides as far as production efficiency is concerned, and the advent of granulation — started some years ago — has caused plant renovations not only in the granulating process, but in the handling of raw materials, batching and mixing as well.

Manufacturers in all industries are now finding that rapid efficient production is advantageous, but that it is only as efficient and economical as their ability to package and ship their product. We in our industry have run up against the same problem. We have increased the speed of our bag making machines considerably, but have realized only recently that we must remove the bags, pack them and ship them at the same rate of speed.

It is only during the last 25 years that materials handling has become recognized as a field unto itself. Materials handling equipment, however, is by no means a recent invention. Conveyors, lift trucks, hand trucks, and overhead cranes have of course been used for many years. The reason that materials handling tools and equipment have gone without the attention they deserve is because, in earlier periods, the supply of unskilled labor was plentiful and wages were at a low level, while the capital expenditures required for machinery were relatively high. This combination did not make the economies of materials handling particularly attractive. Since World War II, however, there has been a complete change in the labor supply market. In the major portion of the country the supply of unskilled labor has been critically short, and from all indications it will continue to be short for at least the next ten years.

Unskilled or semi-skilled labor is normally used to package and move materials. Pay rates for this type of labor have moved ahead considerably faster than the salaries earned by more skilled workers. Moreover, everyone is finding it increasingly harder to get people who will do a decent day's work in handling materials.

Industrial construction costs have increased over those of prewar days more than in any part of our economy. However, the efficiency of conveyors, bagging equipment, lift trucks, and so on, permits better use of expensive warehouse and plant space. This in turn allows substantial savings in capital outlays for construction. In fact, the cost of capital required to purchase materials handling and bagging devices is below the historical average for many years.

Because of rising costs of materials and labor, the cost of bagging materials has necessarily risen. Within the past three years the cost of manufacturing paper has increased over 20%, while the basic cost of paper itself has increased barely 5%. There is not much hope, therefore, of reflecting economies through lower pricing of packaging materials themselves. One of the few avenues open to cost reduction is through more efficient handling of the manufactured material. This can be effected by increasing the tonnage packaged and moved while using the same number of men. It must be borne in mind that packaging and materials handling equipment add only to the cost of a product but not to its value. Engineers estimate that this cost seldom represents less than 20%, and is often as high as 30% of total manufacturing outlays. This equipment can reduce the ultimate cost of the product to the manufacturer, therefore increasing his profit margin.

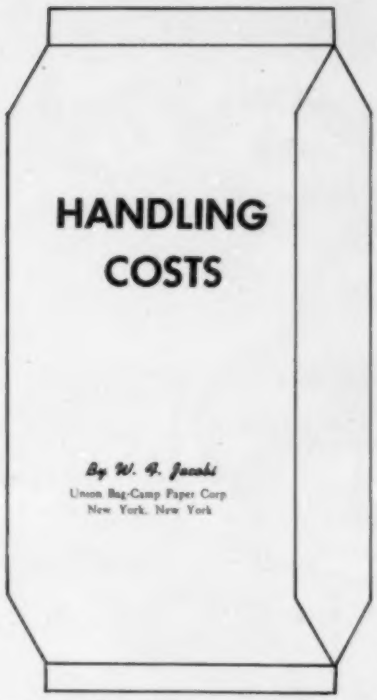
Let us talk specifically about the fertilizer industry. In the packaging of fertilizer there are two materials which can be considered; 1) burlap bags and 2) paper shipping sacks, commonly known as multiwall bags. There are four primary types of multiwall bags that can be considered:

1. Sewn Open Mouth
2. Sewn Valve
3. Pasted Open Mouth
4. Pasted Valve

Factors that must be considered in the final decision of bag type to be used are as follows:

1. Product characteristics
2. Economy
3. Filling & weighing
4. Package appearance & merchandising attraction

Now let us consider No. 1—Is the material hydroscopic? Does it set up? What is its flowability? I am sure that all of you are familiar with these terms and are aware that the products we are discussing are practically all hydroscopic. This in turn affects whether the material will set up or harden. Consequently, it is necessary to have some moistureproof or waterproof barrier construction in the bag being used. Flowability, or the ability of the material to flow readily also affects the construction of the bag to be used. Sifting of material from the bag is a problem with which we are frequently faced. If the material is granular and flows readily,



a much tighter type closure is needed than is used ordinarily.

Now let us consider point No. 2—Naturally all of us are keenly aware of costs of our packaging materials. The greatest danger is in false economies; that is, trying to use a lighter basis weight than is practical, or, in some cases, doing away with the moisture barrier. While lighter basis weights may work satisfactorily for local shipments, their value in the over-all marketing of your product is debatable. If you inventory one type bag for truck shipment, another type for local shipment, and still another type bag for long hauls or railroad shipments you offset any savings effected by lower basis weight—not to mention the loss of customer good will through broken and torn bags. In the bag industry we check constantly factors affecting bag wear, and try to devise new types of construction which will result in greater economies for our customers. One successful shipment, however, does not always prove the case. I feel strongly that one should approach the reduction of basis weights with extreme caution. Economies can be effected by carload purchases, by proper warehousing and inventories, and by proper sizing of bags for the material being shipped. Economies along these lines will lead to the least troubles and greater savings in the long run.

Filling and closing is one of the functions by which the greatest savings in cost can be effected. Up until three years ago (with the exception of valve packers) the industry was using manually operated gross weighing scales which depend entirely upon the operator for rate of speed and accuracy of weight. Today there are various types of high speed, automatic accurate bag filling* devices.

Basically, as far as filling and weighing machines are concerned, there are two types of machines from which to make a choice: The open mouth type, using sewn open mouth or pasted open mouth bags, and the valve type, using sewn or pasted valve bags. There are quite a few factors to be considered regarding these two types of baggers and bags:

1. Cost of the bag
2. Cost of filling and weighing
3. Their carrying ability as far as your product is concerned.

Let us take the first item which is the cost of the bag itself. Naturally, sizes and constructions will vary to some extent; however, picking at random a printed bag constructed of 1/90 asphalt sheet, 1/50 asphalt sheet, and 1/60 multiwall kraft,—size 15 x 5 x 33—generally the cost of this bag will run approximately $90.00 in carload quantities. The cost of closing thread and materials for this size bag would be $1.26 per thousand, giving a total cost of $100.16. A sewn valve bag made from the same materials, 15 x 5 x 32, would cost approximately $108.50 without insert or tuck-in sleeve. The open-mouth bag thus offers a saving in bag costs of $8.34 per thousand bags, not including the cost of the insert or tuck-in sleeve. If a tuck-in sleeve is used, the cost would go up $4.00 per thousand for the valve bags. Naturally, we must take into consideration the fact that the sewn open mouth bag must be closed by the purchaser. This additional operation is offset, however, by increased bagging production.

Another factor to consider is that a bag of greater capacity must be used in order to increase the rate of production. This not only results in high costs, but has a direct effect on sifting, for the looser the pack the greater the probability of sifting through the valve. This probability is greatly increased when packing granular materials, since a loose pack is more likely to permit the granules coming between the valve and the bag. This in turn allows the material to sift.

It is our opinion that the sewn open mouth bag allows for greater economy, greater speed of production, and a positive closure. Valve bags have the advantage of not requiring a sewn closure or sewing operator. However, this advantage, in my opinion, is not sufficiently great to offset the disadvantages which I have already outlined. I realize that many plants are now equipped with valve packers. Naturally, they want to effect as many economies as possible without changing their equipment. I can only state that during the past two years there have been a tremendous number of changes in plants of this type from valve packing to open mouth packing.

Everything that I have said about the differences between the two types of sewn bags also applies to some extent to the same bags using pasted bottoms and closures. Let me, however cite the approximate cost of these bags. The pasted open mouth bag 20" x 29", bottom 5", of the same construction and same capacity, costs approximately $103.60 per thousand. The pasted valve bag, same construction, 20" x 24½", bottom 5", valve 5", amounts to $105.11. Strange as it may seem, the pasted open mouth and pasted valve bags—at least as far as I have been able to determine—are still higher in cost than the sewn open mouth bag.

All in all, the combined high speed production and bag economy offered by sewn open mouth bags offers cost savings from 3¼ to 9½ percent over the other basic types for 50 lb. units, and from 4½ to 8¼ percent for 80 lb. bags.★★

Presented at the Fertilizer Industry Round Table, Washington, D. C., October 16-17, 1956.

*Bagging Equipment, October Agricultural Chemicals, pp. 42-45, 1956.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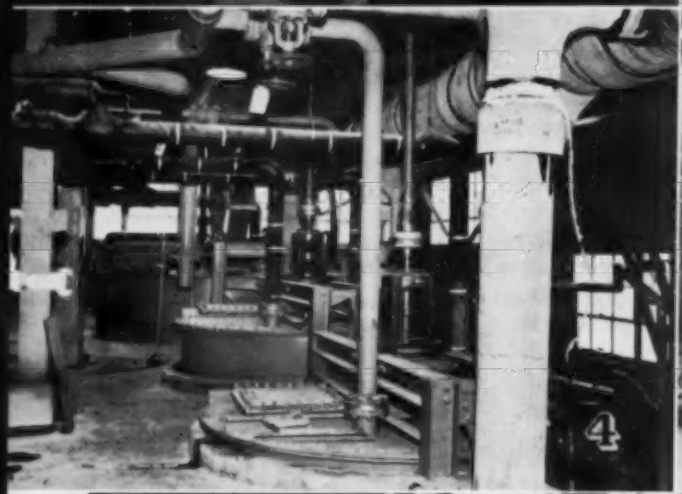
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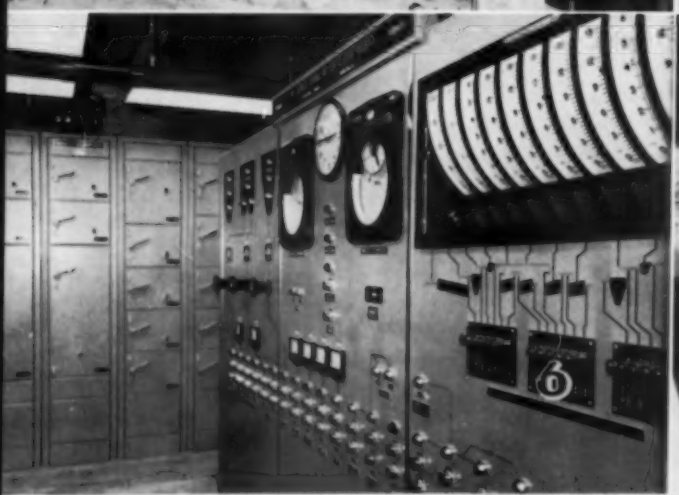
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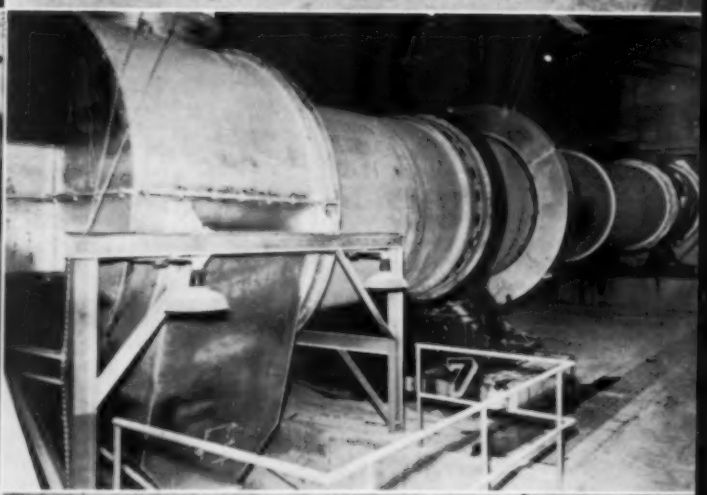
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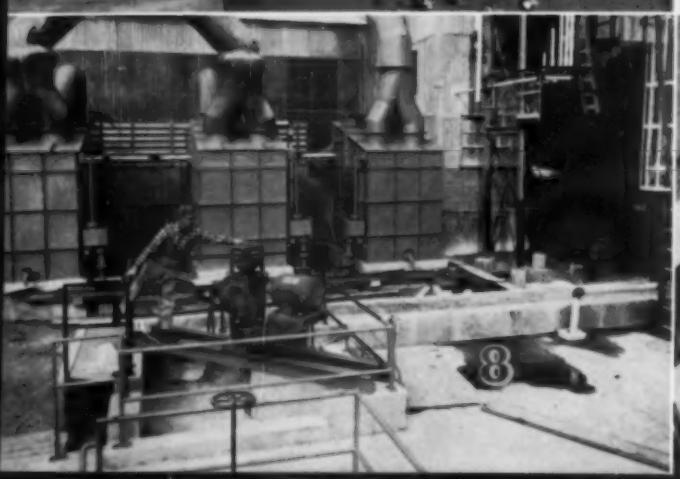
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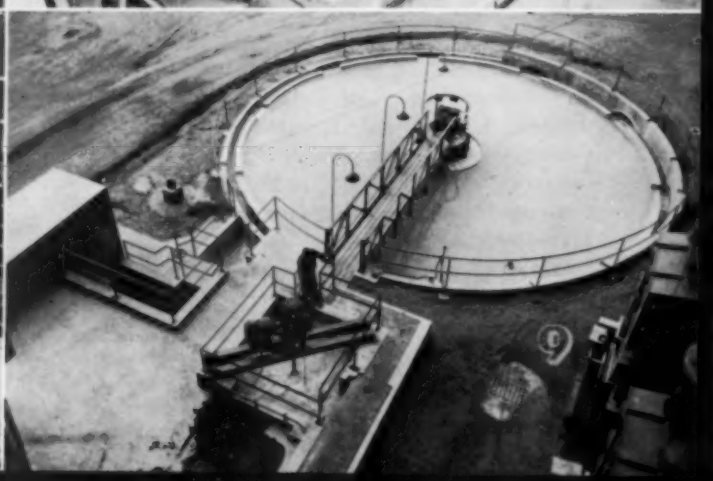
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A DORR-OLIVER AMMONIUM PHOSPHATE PLANT

(1) Birdseye view of the plant. The sulfuric acid pipeline can be seen running parallel to the railroad track.

(2) Phosphoric acid production section — line of agitated reaction vessels.

(3) A traveling pan filter in the phosphoric acid production section.

(4) The ammonium phosphate fertilizer section, a line of agitated reaction vessels.

(5) The blunger, where pellets are coated with ammonium phosphate slurry in the ammonium phosphate fertilizer section.

(6) The blunger control station of the ammonium phosphate fertilizer section.

(7) The ammonium phosphate fertilizer section's eight by 72 foot drier.

(8) Impingement type wet scrubbers in the background. In the foreground, a flash mixer for process water effluent and milk of lime.

(9) Process water treatment plant flash mixer and clarifier.

(10) Storage building in the new Dorr-Oliver plant.

THE Missouri Farmers Association's new fertilizer plant at Joplin, Missouri, is a high analysis pelletizing unit with annual capacity of seventy-thousand tons of complete fertilizers. Principal chemical compounds manufactured are phosphoric acid, ammonium phosphates, and ammonium sulfate. The phosphoric acid is produced by the wet process.

The plant, which went on stream November, 1954, was designed by the Dorr-Oliver Co., Stamford, Conn. Merritt-Chapman & Scott Corporation of New York were the constructors.

By Walter R. Horn

Missouri Farmers Association
Joplin, Mo.

Presented at the annual Fertilizer Round Table Meeting, Washington, D. C., October 16, 1956.

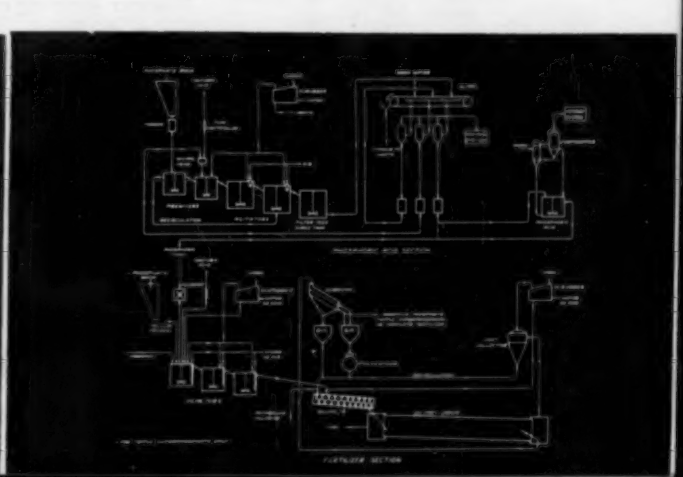
The plant consists of six primary sections. These sections are as follows: Rock Unloading and Grinding, Phosphoric Acid Production, Fertilizer Production, Product Storage, Bagging and Shipping, and Water Treatment.

Rock Unloading and Grinding

THE rock unloading and grinding section consists of the necessary conveyors, silos, grinding mill, and a dust pump. Belt conveyors are used exclusively. The silos are constructed of glazed tile. The grinding mill is a 66-inch high side roller mill. The rock is ground to 60% minus 200 mesh. The dust is conveyed to either the phosphoric acid production section or the fertilizer production section through a pipe in an air stream by the dust pump.

Phosphoric Acid Production

THE ground phosphate rock, a weak phosphoric acid which is the second filtrate from the filters, and sulfuric acid are reacted in rubber lined vessels with violent mechanical agitation. The reaction products are phosphoric acid and gypsum. Sulfuric acid, (66° Bé), is conveyed



through approximately 4,000 feet of regular steel pipe line from the new Eagle-Picher zinc concentrate roasting and contact-sulfuric acid plant at Galena, Kans. The acid is pumped across the state line from Kansas to Missouri. The slurry resulting from the reaction of the rock, the weak phosphoric acid and the sulfuric acid is pumped to the filters, where the two reaction products are separated, and the gypsum is washed continuously and countercurrently before it is discharged from the filters. The gypsum is then slurried with water and pumped to the disposal pond.

The vacuum filters are known as traveling pan filters, which very aptly describes them. The filter consists of a number of stainless steel pans fastened to a rubber conveyor belt. Slots in the pans match open slots in the belt so that the acid which drains from the slurry and through the filter cloth in the pans enters the receiving system through these slots.

The first filtrate from the filters is pumped to the storage tanks where the phosphoric acid is either concentrated before using in the fertilizer section for the production of ammonium phosphates, or it is concentrated for shipment as such. Two single effect evaporators, using steam and operating under a very reduced pressure, are used for concentrating from 32% P_2O_5 to various concentrations up to 55% P_2O_5. This is equivalent to 76% ortho-phosphoric acid. The use of the Dorrco recirculation system minimizes the difficulty connected with the precipitation of calcium sulfate and various fluosilicates on the sides of the flash chamber, and the tubes of the heat body. Two-stage steam jet ejectors are used with each evaporator to maintain a reduced pressure of about 1.5 psia.

Ammonium Phosphate Fertilizer

THE main equipment of the fertilizer production section is the reaction agitators where anhydrous ammonia is added to phosphoric acid and to mixtures of phosphoric acid and sulfuric acid to make monoammonium phosphate, diammonium phosphate and ammonium sulfate. Other essential equipment in this section is a pelletizing unit, large swing hammer pulverizers, a package water tube boiler, a large rotary drier, an acid tower, and impingement type wet scrubbers.

In this section, a variety of high analysis fertilizer grades are produced by varying the relative amounts of monoammonium phosphate, diammonium phosphate and ammonium sulfate. Various ratios of $N:P_2O_5$ can be produced such as $IN:4.5P_2O_5$ with monoammonium phosphate, IN: 2.5 P_2O_5 with 20% mono-80% diammonium phosphate mixtures, and ratios very low in P_2O_5 such as $IN:1P_2O_5$ with ammonium phosphate-ammonium sulfate mixtures. The popular 11-48-0 and 16-20-0 can be made. In addition to these two, the following grades are produced: 19-19-0, 19-38-0, 13-39-0, 16-48-0, 14-14-14, 14-28-14, 12-36-12, and 10-20-20.

The reaction of the acids and the anhydrous ammonia results in a great deal of heat. Temperature is controlled by the evaporation of moisture in the slurry, and supplemented with low pressure air when necessary. The agitated reaction vessels are vented through an acid tower. Dilute sulfuric acid is circulated through the tower to remove any escaping ammonia from the vapors. A portion of this circulation is continuously drained to the reaction system and makeup sulfuric acid is added.

The slurry is withdrawn from the third reaction vessel to a mechanical mixer with two horizontal shafts, each fitted with intergeared paddles. This piece of equipment is called a blunger. The hot slurry meets a large excess of pelleted product. A size separation of this product has just taken place on double deck Tyler Hummer vibrating screens. This product to the blunger is principally the oversize and undersize from the screening operation. The oversize is first sent through a hammer mill. Mixing of the slurry and the fine pellets is rapid. Each pellet receives a coating of the slurry resulting in the general build-up of particle size. The material gravitates from the blunger to the rotary drier.

In the drier the thin coating is dried and the pellet hardened. Each pellet receives a number of coatings by repeating the cycle until it is of proper size to be separated by the screens as product. Each pellet is built-up of multiple coatings. The flow of product and gasses in the drier is concurrent because temperature is critical.

From the drier, the product is elevated to the screens where the size separation takes place. The production amount of the product size goes to storage, and the remainder with the undersize and oversize repeats the cycle by returning to the blunger.

Product Storage Bagging and Shipping

THE product is carried by overhead covered belt conveyor to the product storage building where the material is transferred to a reversible shuttle conveyor for discharge to any of the fifteen bays. The bays are separated by bookshelf partitions. In addition to fifteen bays for product storage, there is a bay for the storage of potash. The capacity of each bay is about one thousand tons. Transfer of the product from storage is by scoop trucks to two continuous bucket elevators. Each elevator has in closed circuit a double deck vibrating screen and a cage mill. The screened product gravitates to two conveyor belts which move the material across the plant trackage to the bagging and shipping building.

Fertilizer is shipped, bulk or bagged, by boxcars or trucks. Valve packers bag the product in 80 pound bags. Fork-lift trucks are used for conveying the bagged material from either the packers or from the adjustment bag storage.

Water Treatment

THE total demand for water is approximately 1200 gpm. Most of this demand is within the process itself. For practical and economic reasons, it was decided to have a water treatment plant, and thereby reduce the raw water intake to about 350 gpm. The principal equipment in this section is a lime slaker, milk of lime feeder, a Dorrco clarifier, and a redwood cooling tower.★★

H. M. Armitage Becomes President of ESA; Robert Metcalf is President-Elect for 1957

THE fourth annual meeting of the Entomological Society of America was held at the Hotel New Yorker, New York City, December 27-30 with the usual full program of reports on a wide range of entomological topics. The ESA meeting was held this year in conjunction with the annual meeting of the American Association for the Advancement of Science, the AAAS sessions being held at the Hotel Statler.

H. M. Armitage became president, succeeding B. A. Porter. Robert Metcalf was named president-elect, and R. H. Nelson continues as executive secretary. P. W. Oman acted as chairman of the program committee for the fourth annual meeting, with R. C. Bushland and E. N. Woodbury serving on his committee. Ralph E. Heal was chairman of the local arrangements committee.

The program featured several symposia, — one on the nematode situation. Participating in this symposium were: Albert L. Taylor of the Horticultural Crops Research Branch of USDA, Beltsville, Md., who contributed "An Evaluation of the Nematode Problem;" Emory D. Burgess, Plant Pest Control Branch, USDA, Washington, "Status of the Golden Nematode;" J. N. Sasser, N. Carolina State College, Raleigh, N. C., "The Soy Bean Nematode in North Carolina;" and Wray Birchfield, Florida State Plant Board, Gainesville, Florida, "The Burrowing Nematode Situation in Florida;" W. Lee Popham, Crops Regulatory Program, Washington, D. C. summarized findings of the symposium participants.

Panticipants in a symposium on Insect Attractants included V. G. Dethier, Johns Hopkins University, Baltimore, "The physiological basis for insect attraction;" A. J. Thorsteinson, University of Manitoba, "Host selection by phytophagous insects;" E. R. Willis, Quartermaster Research Laboratories, Natick, Mass., "Host finding by blood-sucking arthropods;" and D. R. A. Wharton, Quartermaster Research Laboratories, Natick, "Studies on the sex attractant of the American cockroach."

Continuing the emphasis that many entomologists have been placing in recent years on biological control, two invitational papers elaborated on this method of pest control. C. G. Thompson of the Entomology Research Branch, USDA, Beltsville, discussed "The Role of Insect Pathology in Biological Control" while P. B. Dowden, Northeastern Forest Experiment Station, New Haven, talked on "Biological Control of Forest Insects." A number of other papers were presented dealing with the control of various insect pests through pest diseases. Typical of such papers were: "Susceptibility of European chafer and Japanese Beetle Larvae to Different Strains of Milky Disease Organisms" by H. Tashiro, Entomology Research Branch, USDA, Beltsville, and "Laboratory and Field Tests with Granulosis Disease of Red-Banded Leaf Roller" by E. H. Glass of the New York State Agricultural Experiment Station, Geneva.

The section on Chemical Control Investigations, of which C. C. Alexander of Geigy Chemical Co. served as chairman, heard a lengthy series of papers reporting the results of recent test work on chemical control materials and methods. D. W. Hamilton and M. L. Cleveland of the Entomology Research Branch, Vicennes, Ind., gave an interesting paper reporting on use of ryania for the control of codling moth and other apple pests. Codling moth has been developing resistance to DDT over recent seasons and for this reason investigators have been re-evaluating ryania. In 1955 and 1956, performance of ryania equalled or excelled DDT. Ryania was reported by these investigators, to be relatively ineffective for controlling apple pests other than the codling moth. Large scale orchard experiments this past season, however, indicated that some pests may be held in check by ryania, owing to its low toxicity to some of the natural predators.

In a paper by Oliver I. Snapp, Entomology Research Branch, Fort Valley, Ga., on "Plum Curculio Control with Soil Insecticides" it was reported that aldrin was very effective against the plum curculio during its immature stages for a period of at least four years after it was worked into the soil. Dieldrin was a little more effective than aldrin during the fourth year, but less effective during the first three years. Heptachlor was very effective for at least three years, and chlordane was effective for at least a year.

D. M. Tuttle, V. D. Roth and L. A. Carruth of the University of Arizona, Tucson reported on "Status and Control of the Spotted Alfalfa Aphid in Arizona from 1954-1956." They summarized results with thirty-three insecticides used in control treatments, and indicated that a number of the insecticides gave excellent control. The combination which is most commonly used is 4% malathion and 70% sulfur. Parathion and systox were also quite effective. In the chemical control of spotted alfalfa aphid good coverage of the sprayed crop is particularly important, for isolated spots missed in treatment quickly reinfest the whole area. Dusts proved to be moderately superior to sprays.

It was announced the 1957 meeting of the society will be held in Memphis, late in November.

A more detailed report of the ESA meeting will appear in the February issue of *Agricultural Chemicals*.★★

New Stauffer Herbicide

Stauffer Chemical Co., New York, has developed a new herbicide for pre-emergence application which has proved to be effective in controlling all grassy weeds and many broad-leaf weeds. The chemical, which is still classified as "experimental," is identified by Stauffer as EPTC.

Stauffer plans to expand its field testing of EPTC this year in cooperation with a number of agricultural research agencies.

NORTH CENTRAL WEED

THE 13th annual meeting of the North Central Weed Control Conference in Chicago, Dec. 9 to 12, drew a record attendance of over 700 persons from the 14 states and 4 Canadian provinces. Included were college scientists, graduate students. USDA specialists, extension service workers, state and provincial regulatory and enforcement officials, industrial research men and manufacturers of weed control chemicals and equipment.

More than 100 speakers reviewed technical developments in herbicides in agriculture and industry, weed control in turf, and weeds in water and wild life habitats.

Fred W. Slife, Univ. of Illinois, Urbana, Ill., was elected president of the organization for the coming year. Dwight W. Lambert, state dept. of agriculture, Lincoln, Nebr., is the new vice president, and Lyle Derscheid, South Dakota State College, Brookings, S. D., the new secretary-treasurer.

Among annual honors distributed, a plaque was presented to Vernon Woods, Sibley County, Minn., seed and weed inspector, for his outstanding performance of his duties as a regulatory worker. Another plaque went to Alvin A. Kramer, Towner, N. D., in recognition of his superior extension service work. Prof. Raymond Dunham, Univ. of Minnesota, also was honored as the year's most distinguished member of the conference.

Outstanding among many talks during the 4-day meeting at the Hotel Sherman was a plea for more attention to basic research in weed control, made by Dr. A. G. Norman, Univ. of Michigan, Ann Arbor, Mich.

A large volume of valuable new knowledge regarding herbicides has been built up, Dr. Norman conceded. But it deals largely with short range "trouble shooting" problems, he charged, and does not serve as a stepping stone to further long term advances.

The common long lag of 10 to 15 years in massive adoption of new agricultural practices, born of research, does not, he claimed, apply to weed control, which he said is characterized by "reckless adoption" of new findings. "I can't say, that our present research will continue to pay dividends at the present rate. We have solved some of the easier problems, but future progress will not be made by problem solving research."

"The underlying weakness of this program is the great gap in our knowledge of plants and plant growth, and the lack of light on their physiological processes. What do we know about what happens in the plant when we use herbicides? Who can explain the results from application on the leaf? What do we know about a plant's heat and drought resistance? "These are just a few of the basic problems in herbicide research which await solution.

"Agricultural research of the past has emphasized crop improvement to increase yield. All our work in genetics, insecticides, fungicides, has been directed to this end of increasing yield. Our research has gotten out of balance. It needs reorientation and greater use of the funds available to find logical explanations of why plants respond to herbicides as they do. Herbicide research is still young, but it is a young giant. Its future depends on basic research that will build firm foundations from which real progress alone can be made."

Changes lately made in the research program of the U. S. Dept. of Agriculture represent an effort to put weed control on a national basis and keep it up with the times, according to Dr. M. W. Parker, USDA. The staff at present numbers 45 persons but it is hoped that another 15 can be added by next July 1. Funds available from both federal and state sources total $2 million. Screening and testing work done by this agency leaves little time for basic research.

"There is a great potential for a rapid and permanent growth of weed control science," he summed up, "if you view it in broad terms."

"Chemical weed control has come of age, not only as a research development but as a practical agricultural and industrial practice," said Dr. Max T. Goebel, director of research, Grasselli Chemical dept., the Du Pont Co., in his discussion of "Weed Control—An Industry Point of View."

Weed control research is extremely difficult and expensive, he went on. The cost to the Du Pont company of discovery and development of urea herbicides, now lies between three and four million dollars, well over half of this being spent in demonstrating the effectiveness of the material and in proving that it can do the job safely.

"It is much better," said Dr. Goebel, "to demonstrate that an agricultural chemical will not appear on the treated crop in significant amounts, rather than argue about the degree of toxicity of large residues."

State and federal laboratories, he said, were not founded to be free testing agencies for hundreds of purely experimental, untried products and formulations. The Du Pont company thus feels, he explained, that the cost of developing a product should be borne primarily by industry. But, once the basic facts have been established, it seems perfectly proper, he declared, for the industrial concern to discuss the product with federal and state agencies and make it available to them for evaluation from the standpoint of their own interests and programs. As to weed control research, he said, the increasingly cordial and intelligent climate of cooperation between industry and government research "is in the process of ironing out."

For developing fundamental information he declared, academic and government laboratories are pre-eminently equipped. His own and other

By H. H. Slawson

CONFERENCE

companies, he said, carry out logical and continuing exploration into the process of growth but look to the academic and government laboratories for major contributions in elucidating the processes which govern germination, vegetative growth, flowering and reproduction of plants.

"Industry has a stake in development of fundamental information," said Dr. Goebel, "To a certain extent, industry finances this work as part of the tax-paying public. Last year the Du Pont company, alone, paid in taxes, more than three times the total federal appropriation for agricultural research . . . The most important principle regarding use of private funds for fundamental research is that such funds should be given without strings attached."

Frank J. McFarland, of the Food and Drug Administration's pesticide branch, in a talk on "Our Joint Responsibility," pointed out that his agency has much less basic data on toxicity of herbicides than on pesticides. The FDA, he said, is not set up to determine safe tolerances and herbicide manufacturers must be responsible for determining residue tolerances. For most insecticides and fungicides and for some herbicides, the makers have assumed this responsibility, he stated.

Herbicides are relatively new, however, and there has not been time to develop required data. Still, the FDA cannot ignore its responsibility to be sure that crops marketed interstate are pure and wholesome. He urged compilation of all available data on herbicide residues and toxicity, so the FDA "can know what herbicides can be applied by farmers without danger." "We're ready to give you all the advice and assistance we can," he concluded.

State extension services are making substantial contributions to promoting use of herbicides, two speakers announced. Iowa's "extension caravans," which carry all phases of the state university's research findings to the farmers, were explained by Dr. E. P. Sylwester, of the Ames institution. How Illinois is "taking weed research to the farmers" was related by Dr. E. C. Spurrier of the Univ. of Illinois, Urbana. Minnesota's weed control demonstration kit was described by K. L. Blanchard of the Minnesota state department of agriculture.

Stringent provisions of the Alberta weed control statute were outlined by G. R. Sterling of this Canadian province's agricultural department. State regulatory officials comprised a panel which discussed problems in enforcing weed and seed laws of seven midwestern states. Enforcement in Minnesota, incidentally, is lagging, one panelist said, "because some weed control officials do not like to quarrel with their neighbors." Another feature reported how weed control is conducted on a South Dakota Indian reservation. The public relations problem of an aerial crop dusting service was presented in dialog form by Chas. Lafferty and David Mobberly of Lafferty Sprayers, Indianola, Ia.

Predominant throughout the Chicago meeting was the continuous series of rapid fire progress reports on technical developments in chemical phases of herbicides, and accounts of how unusual agricultural and industrial problems were solved by college and industry research workers. Talks were limited to 5 or 10 minutes, and were too numerous to permit summary in the space available here.

In the session on industrial weed control M. C. Swingle, Du Pont, discussed at some length the new substituted urea herbicides and their use by railroads, utility companies, highway departments and others. "Chemical weed killers," said Mr. Swingle, "make simple a job that formerly was costly and discouraging. They are specialized products, and results may vary from complete success to costly failure, depending on factors which can be recognized, and must be accounted for. The product is not always to blame for inefficiency. The unknown ingredient in each package of herbicide is the know-how of the customer who finally puts it to use."

In a discussion of "Ten Years of Brush Control," Homer L. Jacobs, of Davey Tree Expert Co., Kent, O., based his observations on experiences in clearing 50,000 acres of brush along highways, public utility and pipeline rights of way, reservoirs and elsewhere in 30 states. Use of chemicals to control unwanted vegetation is here to stay, he asserted, but it is only in its infancy.

Public resentment against "the streaks of brown, the damage to wild life and the general desolation of the countryside," he asserted is based on misunderstanding what is going to take place. "Garden Club opposition," he said, can be overcome by emphasizing the economics of highway brush control to the taxpayers and its effect in lowering utility rates.

As to crop damage from spray drift, he advised that "We should all ride herd on this problem, so our work will be above suspicion. Otherwise the ill will engendered will hasten the day of restrictive legislation." He suggested also greater use of amine formulations rather than the more volatile ester formulations.

Railroad labor unions are assisting in the increased use of herbicides, G. R. Bargerhuff, of National Aluminate Corp., Huntington, W. Va., announced in his talk on weed control by railroads. The unions, as he explained it, complain that weeds in terminal yards contribute to accidents by making the footing unsafe for switchmen. So the weeds have to go.

The 1957 meeting of the North Central Weed Control Conference will be held in Des Moines, Ia., early in December. A new feature of the program will probably be a "Farmers' Day," when farmers will be invited to come in and learn at first hand of the work being done in their behalf by the North Central Weed Control Conference.

Indiana Fertilizer Conf. Hears Debate on Change to Elemental Guarantees

A DEBATE on the pros and cons of changing fertilizer guarantees from the oxide to the elemental basis highlighted the Indiana Fertilizer Conference at Purdue University, Lafayette, Ind., on Nov. 27 and 28. The conference was attended by 210 fertilizer manufacturers and dealers.

In favor of the change in fertilizer guarantees was V. Sauchelli, chief agronomist for the Davison Chemical Co., Baltimore. He said a change to the elemental basis would be simpler to understand. G. H. Kingsbury, president of Kingsbury and Co., declared, however, that confusion would be greater in the mind of the consumer because of lower numerical guarantees and higher prices.

Dr. Sauchelli asserted that the cost per unit of plant food would probably remain constant or decrease slightly since the trend on the elemental grades would be toward higher-analysis goods. "This would reduce transportation costs, sale costs, and overhead per unit of plant food," he said.

In a round-up of questions and answers on the elements vs. oxides question, Dr. Sauchelli pointed out that although much confusion and misunderstanding was anticipated prior to the change from NH_3 to N, the actual change "occurred smoothly without the anticipated difficulties."

To the question, "How are the percentages as oxides converted into the elements?" Dr. Sauchelli answered that a similar calculation is applied in converting percentage of the oxide form of either phosphorus or potassium to the elemental form. "In each case," he said, "the factor is the ratio of the weight of the elemental form to the weight of the oxide form."

Dr. Sauchelli exhibited a table which compared the present and proposed ratios and grades in Indiana in terms of P and K. The figures seemed to indicate that a slight increase in both phosphorus and potassium could be expected in most cases through the proposed change to the elements.

In closing, Dr. Sauchelli listed some organizations which have endorsed the changes. He cited the Soil Science Society of America, American Society of Agronomy, National Soil Research Committee, Experiment Station Directors Associations of the Western Region and North Central Region, Association of Southern Feed and Fertilizer Control Officials, Association of American Fertilizer Control Officials, and a survey conducted among all extension agronomists and horticulturists throughout the U.S. who favored the change 3 to 1.

Mr. Kingsbury asserted that "confusion would be created in the mind of the distributor who is already burdened with many other problems" in summarizing the negative side of the proposal.

Declaring the change impractical, Mr. Kingsbury cited the problems created for manufacturers and agronomists, as well as distributors and consumers.

He mentioned the manufacturer's educational problems with consumers and distributors which would result from the change.

"While theoretically desirable," Mr. Kingsbury concluded, "it is not practical to make this change now."

The economics of fertilizer use came under discussion by two Purdue agricultural economists—V. W. Ruttan and Earl Kehrberg—and an agronomist — A. J. Ohlrogge. Mr. Ruttan outlined a study of fertilizer marketing now underway at Purdue. Mr. Kehrberg and Mr. Ohlrogge used graphs to show the difference in corn yields between fertilized and nonfertilized areas. They illustrated corn yield response to 4-12-12 equivalent fertilizer and the difference in early growth of corn on fertilized and nonfertilized areas.

W. R. Allstetter, vice president of the National Plant Food Institute, predicted that the soil bank will have little effect on fertilizer consumption in Indiana. He told the conference that he sees a slight reduction in the amount of fertilizer used for wheat. "Only six per cent of Indiana's farmers have signed up for the wheat phase of the soil bank program," he said.

As for corn, Mr. Allstetter explained that most of the 1956 participation in the soil bank was accidental or windfall participation by farmers who stayed within the corn acreage allotments for price support or other reasons.

Mr. Alstetter said that the most serious aspect of the acreage reserve program in Indiana is that it is permissible under the program to leave acreage planted in reserve without cover, thus creating an erosion hazard.

At a noon luncheon on the first day of the conference, the fertilizer manufacturers heard a "Banker's View of the Agricultural Future." Ted Axston, president of the Lafayette Savings Bank, forecast a bright future for agriculture despite the current surplus problem. He pointed out that a new intermediate-type loan of three to five years in duration offers a great service to farmers in need of loans.

Fertilizer recommendations for 1957 were distributed to the conferees. Prepared by the department of horticulture at Purdue, the recommendations were for: vegetable crops on muck soils, vegetable crops on mineral soils, fruit crops, evergreens, and deciduous trees and shrubs.

A. H. Beers, executive secretary of the Middle West Soil Improvement Committee, said it is up to the fertilizer industry to promote its own product. An agronomist for Swift and Co., A. H. Bowers, spoke on "What's in the Price of Fertilizer." J. B. Peterson, head of the agronomy department at Purdue, also made a brief address.★★

Dispute Over Use Of BHC For Forage Crops Aired At Ohio Pesticide School

CONTROVERSY over the use of BHC for forage crops marked the final session of the Ohio Pesticide Institute's 10th annual school and conference November 19 and 20 at Columbus, Ohio.

OSU extension entomologist Lyle Coleman told OPI members BHC would undoubtedly be removed from the recommended list in 1957 because of the residue problem. He pointed out that the U. S. Food and Drug Administration had not set up tolerances for the chemical in forage spraying.

Research entomologists at the Ohio Experiment Station, however, cited data to show that legumes sprayed for spittlebugs 3 to 4 weeks ahead of harvest would be safe for use. Moreover, BHC gives better control of the insects than most other chemicals, they said. But the fact that some growers may disregard the time limit introduces a real danger in recommending BHC, entomologists agreed.

Big dealer question of the conference was what to do with present stocks of BHC when its use is no longer recommended for forage crops.

C. R. Weaver of the entomology staff at the Ohio Station reviewed tests to show that granular insecticides, including BHC, gave control of spittlebugs equivalent to spray formulations and at the same time would leave less residue. Despite this fact, OPI officials predicted that lack of F & D approval would eliminate any form of BHC from the 1957 recommended list of forage crop insecticides.

Among new recommendations for the 1957 apple spray program was the one that a dormant oil spray be omitted for most commercial orchards except where scale is prevalent. Insects and mites once controlled by dormant spray may now be checked more efficiently later in the season. Growers are being cautioned not to apply lead arsenate or DDT on any apple variety within 40 days of harvest.

Two additional pesticides are being included in the 1957 list for control of vegetable insects: Systox for beans (21-day pre-harvest application limit) and Phosdrin for worms attacking cabbage, Brussels sprouts, broccoli and cauliflower. One-half pound of actual toxicant per acre is the rate suggested for Phosdrin. There is a 3-day limit on cabbage and a 1-day limit on Brussels sprouts.

No changes are being made in the 1957 program for fungicide use.

Speaking for the U. S. Food and Drug Administration, Joseph J. Milunas told the OPI conference that use of new, highly effective and toxic pesticides imposes a heavy responsibility on those who make up spray schedules. He said agriculture could expect tighter controls under the expanded scope of the Miller Ammendment.

In cases where related chemicals are used in combination, Mr. Milunas said tolerances should be added together for the final rating of the spray. With unrelated compounds, the user should consider only the lowest allowable tolerance of all components.

One of the biggest problems in the use of pesticides, Mr. Milunas pointed out, is that the grower will not find all the information he needs to know on the label. For example, he stated that the endrin label specifies the chemical should not be used on cabbage after the head forms. Exactly when the plant reaches this stage may be interpreted differently by growers.

Dr. C. R. Neiswander, associate chairman of the Ohio Station's entomology department, reported on the Washington conference on the Miller Amendment. Science is conducting an intensive study on the residue problem, he said. "We are not really alarmed," Dr. Neiswander said, "but we want to keep conditions from reaching that state where we might be concerned."

According to the Washington report, each dollar spent for pesticides returned $52 in increased yield and quality. Despite the stepped-up use of pesticides since World War II, there have been no increases in accidental deaths from pesticides. An outgrowth of the conference in the near future will be a data sheet giving tolerances and other factors to help growers use chemicals wisely.

A total of 45 scientific papers were presented at the two-day OPI meeting by staff members of the Ohio Experiment Station and extension personnel of Ohio State University. Presiding officer was M. G. Farleman of Standard Oil Company.

In a discussion of the persistence of insecticides in controlling turf grubs, Dr. J. B. Polivka stated that both chlordane and dieldrin are effective. An application of 5 lbs. actual chlordane per acre has been found to be effective for a period of 8 years at the Ohio Station. Three pounds of dieldrin to date has given control for 4 years.

Dr. Polivka also reported that DDT and malathion are still the best chemicals for controlling Japanese beetles. Two new promising chemicals are Niagara's Thiodan and Carbide and Carbon's No. 7744.

Streptomycin is the only antibiotic spray to date found practical for control of fireblight on apple and pear trees, plant pathologist Frank Winter declared. Results of a 3-year test at the Ohio Station show control of the disease can run as high as 100 percent with a 120 ppm formulation of streptomycin.

Brown rot on plums is moderately controlled by sprays of either Captan, Thiram or Thioneb, Mr. Winter stated. On peaches all were good. Captan gave the best control of storage rot, also its use resulted in less residue than from sulfur which leaves an objectionable color on the fruit.

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PESTICIDE SALES HIT RECORD HIGH IN 1956

PESTICIDE chemical sales in 1956 will reach an estimated $250,000,000 at the basic producers' level, a new, all-time high for the industry. This is 25 percent higher than the 1955 producers' sales of $200,000,000, according to the National Agricultural Chemicals Association.

Sales during the year were boosted by a variety of developments, including a series of heavy insect infestations, particularly in the south and southwest, and a greater use of pesticide chemicals in public health programs throughout the world.

The heaviest insect outbreaks were the Mediterranean fruit fly which threatened the citrus industry in Florida, the spotted alfalfa aphid in the southwest, and heavier than usual infestations of the boll weevil in the south and the grasshopper in the west.

Growing Markets

MARKETS for pesticides expanded in four different areas during the year: 1) the farm market where more farmers are using pest control chemicals to reduce per unit costs of production; 2) the home garden market — the rapidly increasing number of suburbanites are using these products to grow healthy plants and weed-free lawns; 3) increased use of insecticides in public health programs to wipe out certain diseases through the elimination of disease-carrying insects; 4) increasing use of chemicals to control weeds, brush, insects, and turf diseases along roadsides of the nation's highways.

Exports of pesticide chemicals, which showed a major gain in 1955, slowed somewhat during 1956. First six month figures show exports of 158,608,000 pounds valued at $44,454,000. This represents a drop of 5 percent in quantity but a 6 percent increase in value over 1955. Exports to the Caribbean, South America, Asia, Oceania and Africa all increased during the year.

Except for 2,4-D, the output of basic pesticide chemicals in 1956 was well ahead of 1955. Figures for the first 11 months of the crop year show that benzene hexachloride (gamma basis) was up 66 percent; DDT was up 25 percent; 2,4,5-T was up 74 percent; and copper sulfate was up 4 percent. The drop in 2,4-D production may be due in part to large carryover stocks from the 1955 season.

Carry-over Stocks of Pesticides Larger Than in 1955:

THE U. S. Department of Agriculture reports that carry-over stocks of most pesticides as of September 30, 1956, were larger than on the same date a year ago.

Results of a survey conducted by the Department indicate that manufacturers, in establishing production schedules in 1956, kept output well above levels needed to meet increased demand and replenish distributive channels.

Pesticide carry-overs in the hands of basic chemical producers increased more than formulators' inventories. For example, producers stocks of the chlorinated hydrocarbon group (aldrin, chlordane, dieldrin, endrin, heptachlor, and toxaphene) were up over 90 percent, whereas formulators' stocks increased only 20 percent. Producer stocks of DDT, technical and mixed, were 78 percent larger as contrasted with an increase of 46 percent for stocks in hands of firms formulating but not manufacturing the product. Producer stocks of undiluted benzene hexachloride grades showed a 100-percent increase.

(Basic producers of pesticidal chemicals may or may not formulate pesticides, and mixers may have both undiluted and formulated materials on hand. Figures in the accompanying table are based on type of stock-diluted or undiluted — rather than on type of business.)

Increased inventories of calcium arsenate reflect the revival of interest in this material to control the boll weevil in cotton areas where this insect has acquired resistance to newer organic insecticides. Formulators' stocks of lead arsenate decreased 14 percent from a year earlier.

The Department carries on its pesticide inventory surveys in cooperation with the National Agricultural Chemicals Association. This report is based on returns received through December 10, 1956, from basic producers and pesticide formulators. A report to be issued within the next two months will show estimates in terms of pounds. Pesticides stocks of all manufacturers and formulators reporting at end of 1956 as compared with end of 1955-crop year.

Pesticide	Overall stock (technical and formulated)	Technical (undiluted)	Formulated (mixed)
Aldrin to toxaphene group*	plus 63%	plus 74%	plus 32%
Benzene hexachloride:			
All grades (gamma basis)	plus 74%	plus 102%	plus 24%
12 to 24% gamma	—	plus 102%	—
36 to 46% gamma	—	plus 108%	—
Lindane (99%)	—	plus 46%	—
Calcium arsenate	plus 178%	—	—
2,4-D	plus 32%	plus 39%	plus 26%
DDT	plus 66%	plus 101%	plus 26%
Lead arsenate	minus 3%	—	—
Organic phosphorus insecticides	plus 22%	plus 24%	plus 20%
Rotenone	plus 22%	—	—
2,4,5-T	plus 26%	—	—

(Note: Figures show change Sept. 30, 1956 over same date in 1955.)
* Includes aldrin, chlordane, dieldrin, endrin, heptachlor and toxaphene.

American PHYTOPATHOLOGICAL SOCIETY Elects G. Fisher President

A FUNGICIDE Colloquium, featuring four noted authorities in the field of agricultural chemicals, opened the 48th annual meeting of the American Phytopathological Society in Cincinnati December 6-8.

Speaking for the National Agricultural Chemicals association, executive secretary L. S. Hitchner discussed the needs of the expanding pesticide industry. Some, which he mentioned were: (1.) to continue to improve cooperative relationships throughout industry and between industry and scientific groups; (2.) to maintain realistic regulation of pesticide manufacture and use, and (3.) to better educate the public so that it will understand the place of pesticides in guaranteeing a safe, ample food supply.

The future prospects of chemical control of cereal rusts were termed "good" by John B. Rowell, University of Minnesota plant pathologist. Rowell, who traced the history of a 60-year search for better ways of fighting cereal rusts, announced that the National Cooperative Rust Fungicide Tests are to be resumed. Several promising experimental compounds will be tested for rust control on different crops from Texas to Manitoba.

While history shows little success with soil fungicides, their future role in the control of plant root infections appears promising, according to L. W. Koch of the Science Service Laboratory, Harrow, Ont. He said that soil fungicides with systemic abilities offer the ideal method for controlling root rot diseases. Systemic fungicides that would be absorbed through the roots of plants to protect the entire plant from infection, would provide man for the first time with a way to control diseases that are now beyond economic control.

Robert H. Daines, of the New Jersey Agricultural Experiment Station, cited the annual $3 billion toll placed on agriculture by plant diseases as evidence of the future opportunities for fungicidal chemical development. He predicted rapid advancement, not only because industry continues to develop promising materials, but because science is learning more about the mode of action of fungicides.

Mr. Hitchner, as the first of the Colloquium speakers, discussed two recent developments relating to pesticide regulation that he considered to be serious problems now facing the agricultural chemicals industry.

The first, was the recent suggestion made by various regulatory officials to amend legislation to require "that all seed-treating chemicals contain enough coloring matter to color distinctly all treated seed." Such legislation, Mr. Hitchner said, would in effect "establish a bad precedent of regulating the pesticide industry in order to police growers and seed treaters who are violating existing laws" by diverting treated seed into food and feed channels.

A second and somewhat similar problem according to Mr. Hitchner, relates to the Food and Drug Administration's advice to growers that pesticide chemicals applied to fresh fruits and vegetables to inhibit mold and decay are chemical preservatives, and that treated produce must be marked to this effect. The use of such commonplace fungicides as copper and sulfur can become involved in this interpretation.

Mr. Rowell, another of the Colloquium speakers, felt that the resumption of extensive testing of rust-controlling chemicals by federal and state agencies could result in significant progress toward an economically feasible means of controlling cereal rusts. The National Cooperative Rust Fungicide Tests are to be sponsored by the U. S. Department of Agriculture.

Mr. Rowell also believed that intensification of basic research will speed progress. There is much to be learned about the physiology of host, pathogen, and disease. He asked: Who can predict when some fertile mind will devise a means of using chemicals to induce disease resistance of a nature that is obtained today only by prolonged efforts of plant breeding?

Mr. Koch, a Canadian plant pathologist, considered correct diagnosis of soil-borne diseases as one of the chief obstacles to the expanded

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Newly elected officers: Glenn Pound, vice president; Paul Miller, President elect; Roy Young, councilor-at-large; George Fischer, president; and William Hewitt, secretary.

DR. L. D. Newsom, one of the nation's leading entomologists, called for the greatest research effort in the history of cotton insect control to solve the riddle of insecticide resistance. Dr. Newsom told the second annual Beltwide Cotton Production Conference, held at the Dinkler-Tutwiler Hotel, Birmingham, Ala., on Dec. 13 and 14, that cotton insect resistance was proved or suspected in at least seven states during the 1956 season.

By 1954 cotton entomologists were beginning to show concern about the possibility of resistance developing in cotton insect pests. In 1954 and 1955 growers in parts of Louisiana began expressing belief that the boll weevil was becoming resistant to chlorinated hydrocarbons.

"With the present trend toward the use of increasingly effective insecticides on a larger portion of the cotton acreage, it seems probable that resistance to chemicals in cotton pests will continue to be a problem," Dr. Newsom stated. "Certainly it is one of the most important problems facing entomologists in the South today.

"Although it has been demonstrated that resistance can be coped with on a short-range basis, long-range problems may be much more difficult," Dr. Newsom declared. "Switching from one insecticide to another is likely to provide nothing more than temporary relief."

He warned that it may be necessary for the grower and the insecticide industry to accept drastic changes in recommendations, often on short notice. It may mean changing from a highly efficient to a less efficient insecticide, from a cheap material to a more expensive one, or from a relatively safe to a more hazardous insecticide.

"There can be no excuse in the future for being caught as unprepared for the development of resistance in a pest as was the case with the boll weevil," said Dr. Newsom. "With a program based on sound research and aggressive extension work, resistance to chemicals in cotton pests is another problem which can be solved satisfactorily."

Also speaking on the value of basic research for control of insects was Dr. E. F. Knipling, chief of U. S. D. A.'s Entomology Research Branch, Beltsville, Md., who said that the cotton industry has been so busy putting out insect "fires" that it hasn't been able to devote enough time to understanding their real nature in the first place.

"Applied research is a kind of expedience we have had to exploit to attain the high degree of productivity we enjoy today," Dr. Knipling said. "But in attaining that high degree of productivity we have also been reworking our fundamental research information to the point of exhaustion."

"With the resistance problem threatening to nullify advances in chemical insect control," he said, "the need for more information on its nature and cause becomes obvious."

Dr. Knipling sees great potentialities in the use of attractants — such as food and sex — in control of the boll weevil and other insects. He said angelica seed oil, associated with sex responses, may represent the difference between success and failure of Mediterranean fruit fly control in Florida.

Cited as an ideal means of reducing insect losses was the development of suitable plant varieties resistant to insect attack. Varieties of wheat virtually immune to hessian fly attack and varieties of sweet corn resistant to the earworm are available now, Dr. Knipling said.

Claude L. Welch, director of production and marketing division, National Cotton Council, told the conference that results from cooperative research in pink bollworm control have been "coming much faster than most of us expected" when the program began in 1952.

"Already cotton industry savings from this program come to well over $2,250,000 annually," he said, "compared with a cumulative research expenditure of just over $1,000,000."

The federal government, various state governments, and the entire

Cotton Production Conf.

- **Attractants—A Future Pest Control Measure.**
- **Thimet, Bayer 19639 for Seed Treatment.**
- **CIPC and Diuron Herbicides widely used in South.**
- **Organic phosphorus compounds, arsenicals, granular insecticides under study.**

The theme of this year's conference was, "Examining Cost-Cutting and Quality-Improvement Potentials in Cotton Production." More than 800 agricultural leaders attended the two day meeting which was opened with a welcoming address by Dr. E. V. Smith, Dean of the School of Agriculture, API.

Dr. Newsom, head of entomology research at Louisiana State University, said that basic research projects must be undertaken immediately to answer such questions as how insecticide applications and combinations affect resistance. Studies also must be made, he said, to find out how insecticides actually kill insects if we are to develop chemical compounds that will control or delay resistance.

Resistance to insecticides in cotton pests has been known since the summer of 1951 when chlorinated hydrocarbons failed to control the leafworm in Venezuela, Dr. Newsom reported. By 1953, it became apparent that the leafworm had developed resistance in this country.

cotton industry cooperated in an emergency buildup of the research program in what Mr. Welch called a "classic example of what can be accomplished through cooperation."

"We must see to it that there is no drastic curtailment in this program which has paid such dividends," Mr. Welch added. He urged full support of the "effort to obtain adequate USDA appropriations for pink bollworm research."

K. P. Ewing, head of the cotton insects section, USDA, covered new developments in systemic insecticides as a member of a symposium on "What's New in Controlling Cotton Insects."

The practice of controlling insects through insecticides in the sap stream of the cotton plant offers great potentialities, according to Mr. Ewing, who reported on research on the subject during 1956. Experiments covered every major cotton-producing state.

In numerous field experiments across the cotton belt "Thimet" and a new phosphorous compound, Bayer 19639, were tested as seed treatments. Almost without exception, Mr. Ewing found, each insecticide gave excellent control of thrips, aphids, and spider mites from four to six weeks after plant emergence. They also gave fair to good control for a limited time against the cotton flea hopper, white flies, flea beetles, leaf miners, cotton leaf perforator, darkling beetles, and brown cotton leafworm.

Mr. Ewing said that for safety in handling and to insure proper mixing, custom treatment of seed is recommended as the best method of distributing the insecticides for large scale experimentation and farmer use. Evaluations made by the USDA Agricultural Marketing Service showed the insecticidal treatments had no adverse effect on grade or staple of the lint. In a majority of the experiments, however, seed germination was reduced or retarded by the insecticides.

Custom treatment of seed with "Thimet" cost farmers about $3 per acre in 1956. Mr. Ewing estimated that between 3,000 and 5,000 acres of commercially treated seed were planted in Mississippi, between 15,000 and 20,000 acres in Texas, and a few thousand acres in Arkansas, Louisiana, Oklahoma, Missouri, New Mexico, and Arizona.

Speaking on "Promising Herbicides for Weed Control in Cotton," Dr. John T. Holstun Jr., agronomist at the USDA research station at Stoneville, Miss., told the Cotton Belt agricultural leaders that there is hope of finding a single herbicide satisfactory for most weed control problems in all cotton production areas. "While such a herbicide has not been found," he said, "it is within the range of reasonable expectations."

Outlining recent research in herbicides, Dr. Holstun said that no preplanting herbicides generally are recommended at the present time, although some favorable results have been obtained in Texas on control of Johnson grass.

In the pre-emergence phase of weed control, CIPC and "Diuron" are the only herbicides widely recommended, and their use is mostly confined to the Southeastern states.

Dr. Holstun sketched research on post-emergence chemicals stating, "Few promising new herbicides have been found for post-emergence use in cotton, but there are several that may prove useful in alleviating one or more problems."

He said that present research in herbicides generally is supplementing established practices rather than pointing toward a revolutionary new method of weed control.

E. Buford Williamson, agricultural engineer at Delta Branch Experiment Station, Stoneville, Miss., reported a stimulated interest in agricultural aircraft research and pointed to a project now under way at the Aircraft Research Center, Texas A. & M. College.

Improvements in both air and ground machines were cited by Mr. Williamson who also told of the particular emphasis that has been placed on spraying equipment in recent years.

The search for new ways to kill boll weevils that have become resistant to widely used insecticides was described by Dr. Dial F. Martin, entomologist from Texas A. & M. College. The search includes experiments with organic phosphorous compounds, calcium arsenate, and granular insecticides.

Dr. Martin said that there is need for an effective arsenical that can be applied in spray form and that most investigators wish to make further studies of granular forms of insecticides for control of boll weevils and other pests.

Speaking on future basic research in weed control, Dr. W. C. Shaw, USDA plant physiologist at Beltsville, said that a well-balanced research program is urgently needed if there is to be continued progress.

Dr. G. M. Watkins, head of the department of plant physiology and pathology, Texas A. & M., said that the cotton industry probably is no more than half way along the path to complete mastery of cotton diseases. He called for an increase in the pace of research on cotton diseases.

Use of nitrogen in the Southeast could be increased profitably at least fourfold on the better soils, according to Dr. Robert W. Pearson of Alabama Polytechnic Institute, Auburn, who spoke on new ideas in cotton fertilization.

The beltwide conference was held in cooperation with the land-grant colleges, the agricultural chemicals industry, the U. S. Department of Agriculture, vocational agriculture, and farm organizations. J. D. Hays, Vice President of the Alabama Farm Bureau federation, was general chairman of this year's meeting. Presiding officers were; P. O. Davis, director of the Alabama Agriculture Extension service, Auburn; and Dr. M. D. Farrar, Dean of Agriculture, Clemson Agricultural College, Clemson, S. C.★★

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Southern Weed Conference

The tenth annual Southern Weed Conference is scheduled to be held at the Bon Aire Hotel, Augusta, Ga., on Jan. 23, 24, and 25.

THIS ADVERTISEMENT sells new Hi-D Ammonium Nitrate Fertilizer. It appears in February issues of *Capper's Farmer, The Progressive Farmer, Prairie Farmer, Farm & Ranch,* and *Florida Grower and Rancher.*

Farmers asked Question after Question about HI-D Ammonium Nitrate

Read the kind of down-to-earth questions that many farmers fired at us and you'll see why they decided to make Hi-D Ammonium Nitrate their first choice as a supplemental Nitrogen Source.

Q. What's this "Hi-D" and what's so new about it?

A. Hi-D stands for high density. Hi-D Ammonium Nitrate is a hard, dry fertilizer that's made by an exclusive, patented process. It's a denser product with the maximum moisture "squeezed" out of it before the granule is formed. There isn't another form of ammonium nitrate like it!

Q. What about storage?

A. Commercial Solvents Corporation guarantees that Hi-D Ammonium Nitrate will store well under normal conditions for one full year. And, by the way, that brings up another advantage of Hi-D. Being a denser, more compact material, it has less bulk, takes up less room in storage. 10 bags stack in the same space as 8 bags of other types of ammonium nitrate. That means you can get up to 25% more nitrogen in a normal hopper load.

Q. Well, how does this denser material perform in the spreader?

A. High density means a drier ammonium nitrate. And that means that Hi-D doesn't gum up, doesn't stick, clog, cake or bridge, even on soggy, steamy days.

Q. How does it spread? Hi-D looks different.

A. You're right, Hi-D *is* different. Note the controlled size and unique shape that assure smooth, even distribution in all types of spreading equipment under all field conditions. The beauty of it is that it really flows freely, spreads evenly and stays put!

Q. Doesn't this same high density make for slower action in the soil?

A. Absolutely not. Hi-D dissolves readily in soil moisture, goes to work fast. But as you probably know, Hi-D Ammonium Nitrate gives Two-Step Action. The guaranteed 33.5% N comes in two balanced "servings". You get 16.75% nitrate nitrogen that goes to work immediately for fast, vigorous starts, and 16.75% ammonia nitrogen for sustaining follow-up feeding. Interesting thing about Hi-D, it contains the kind of nitrogen in sodium nitrate *and* the kind in ammonium sulphate as well.

Q. It ought to be better than sodium nitrate and ammonium sulphate — it costs more per bag. What do you say about that?

A. No, no, it costs less! Sure, bag for bag it costs more, but you forget you're not buying bags, you're buying *N*. 100 pounds of Hi-D gives you as much nitrogen as 159 pounds of ammonium sulphate, gives you as much nitrogen as 209 pounds of sodium nitrate. Putting it another way, for 100 pounds of straight N you need over 600 pounds of soda, nearly 500 pounds of sulphate, *but only 298 pounds of Hi-D.*

Q. They say that ammonium nitrate is acid forming. Is Hi-D?

A. Acid forming is just another way of saying that growing crops remove calcium from the soil. Hi-D helps make big crops which take out more calcium than small crops. Of course, some products do include lime but it's an expensive way to get insufficient limestone. As you know, the lime in such products is only enough to neutralize the fertilizer. It's not sufficient to meet the important requirements of a sound, integrated liming program.

Q. Where does Hi-D fit in my fertilizer program?

A. Good question! It gives us a chance to stress mixed fertilizers. We don't sell mixed goods but we can't overemphasize their importance. Hi-D is not a substitute for mixed fertilizers. It's a supplement. Many crops take more nitrogen from the soil than can be put back readily in mixed fertilizers. The role of supplemental nitrogen is to satisfy this additional need. In many cases supplemental nitrogen is the lowest-cost way to get maximum profits. Hi-D Ammonium Nitrate is only one part of your program for lowering crop unit costs. You know better than we do that income goes down unless production per acre goes up. Fertile land is profitable land. Land fertility calls for soil testing, a liming program, the mixed fertilizer your dealer recommends — then, and only then, Hi-D Ammonium Nitrate as needed.

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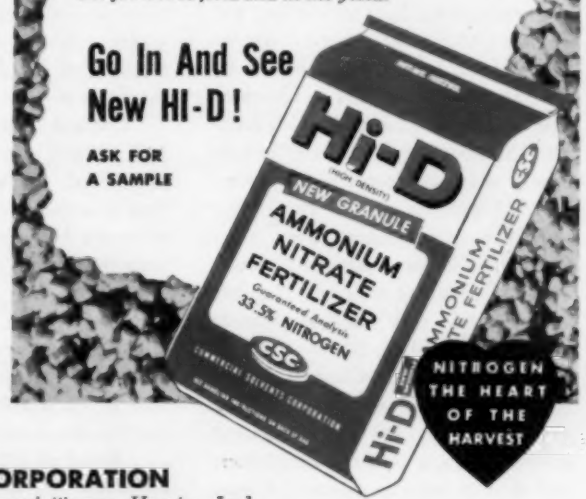

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Midwest Garden Supply Show Features Aerosols for Home Lawns, Gardens

By H. H. Slawson

AN optimistic throng of some 7,000 dealers in garden supplies were registered at the 15th National Garden Supply Show, held on Chicago's mile-long Navy Pier, Nov. 18 to 20.

An estimated sales volume of $3 billion is envisioned for the industry in 1957 and, to help dealers in attaining this goal, the sponsors of the show, Garden Foundation, Inc., and the magazine, *Garden Supply Merchandiser*, arranged a number of new sales promotion features, centering on the theme "Everybody Sells Garden Supplies."

Topping these in interest and effectiveness was a short course in retail sales management, held at the Morrison Hotel with an attendance of over 800 dealers, distributors and manufacturers. Other sales promoting features in the show at the Pier included a series of audio-visual training aids, a model store exhibit presenting tested ideas for store layout and display, a human relations clinic, a school garden program demonstration, discussions of service shop operations, how to buy and sell nursery stock and other pertinent facets of the garden supply business.

The latest chemical products to ease the pest and disease control problems of home and commercial gardeners were well represented among the 225 exhibits at the Navy Pier show. Also prominent were plant foods, applicator equipment, newly designed packages with engaging eye appeal and new dealer-assistance merchandising plans.

California Spray-Chemical Corp., Richmond, Calif., is marking its 50th anniversary in 1957 by introducing several products in aerosol containers and a new squeeze duster. A new musical ballad, the "Ortho Polka" song, has been composed and recorded for dealer tie-in advertising over their local stations. A new edition of the Ortho Garden Book is available and, for the kids, a new Ortho kite. Another anniversary marker is a new giant variety zinnia, christened the "Ortho-Polka Zinnia," which has been developed by Cal-Spray plant breeders for distribution to the trade in 1957, it was announced.

Included in the new aerosols are an indoor plant bomb, an ant and roach bomb and a dog repellent, while the new squeeze duster holds an improved rose dust formulation. Also shown was the full line of "Ortho" herbicides, plant foods and household insect control products Chas. Lupsha, sales manager, was in charge of the exhibit.

Boyle-Midway, Inc., New York, introduced a new "Leaf-Shine" for cleaning and imparting a luster to hard leaf plants in indoor planter boxes. Featured in the full line was an African violet and houseplant insect bomb, a multi-purpose rose spray bomb, multi-purpose dusts, a dog-repellent, ant killer, slug and snail killer and a "one shot" "Lawntrol" granular insecticide for common lawn pests. Tom Blankley, sales manager, in charge.

Davison Chemical Co., Baltimore, Md., showed a water soluble 20-20-20 plant food, for which distribution is now planned in northern states after extensive distribution in the South for several years. Shown, also, was "Wonder-Gro," a lawn and ornamental fertilizer, which is being introduced to the horticultural trade after long use by farmers. In charge was B. C. Mankas, manager of the new products marketing division.

Standard Oil Co.'s line of petrochemicals has been steadily expanding, a visit to their booth revealed. Shown there were weed and brush killers, garden and household insect sprays, herbicides and lawn insect sprays and other items. Featured was a new aerosol insect killer for space spraying and an aerosol moth killer. Standard's "Pressure-Pak" bug and ant spray was demonstrated also. Gordon Boak, sales manager, in charge.

Niagara Chemicals, Middleport, N.Y., a division of Food Machinery & Chemical Corp., called attention to newly designed, colorful containers to be used in 1957 for their full line of dusts and sprays for the home gardener. Raymond Dylewski, sales manager, in charge.

Stauffer Chemical Co., Omaha, Nebr., introduced "Vapam," a new soil fumigant for use on lawns, to eradicate weeds, fungi, insects, nematodes and soil pests generally. Also played up was "Captan 50-W," a fungicide for the apple, peach, cherry and strawberry grower. R. F. Chenik, sales manager, in charge.

American Agricultural Chemical Co. had a display of their "Agrico" line of special purpose plant foods, formulated and individually packaged to meet requirements of roses, bulbs, turf, shrubs, broadleaf evergreens and acid loving plants.

Several new fertilizers in 5 and 10 lb. packages were featured in the Faesy and Besthoff, Inc., New York, display. These new products are Muriate of Potash, Sulfate of Ammonia, Nitrate of Soda and Superphosphate. In addition to the full F&B line of agricultural insecticides and fungicides, the exhibit included bone meal, Longhorn, Ramshorn and Wizard Manures, and a Rose Dust. E. McGown of the midwest, and Howard Hamilton of the New York F&B offices attended the booth.

Flo-Max Fertilizers, Inc., Chicago and Houma, La., which has been manufacturing concentrtaed liquid fertilizer for farm use for several years, made their first showing of their ""Flo-Mix" packaged for home and lawn use. A plastic squeeze type container in 6 or 12 oz. size is now offered for use on house plants and for the lawn a half-gallon container with jet pump and hose attachment is

(Continued on Page 115)

LISTENING *Post*

Report on Contact Fungicides for Control of Peach Scab

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Epidemics and Identification Section, Horticultural Crops Research Branch, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

RICHARD H. Converse reports trials of contact fungicides, conducted by the Oklahoma Agricultural and Mechanical College in cooperation with the United States Department of Agriculture, for control of pecan scab on nursery trees and in orchards. *Cladosporium effusum*, the fungus that causes the disease, lives from one growing season to the next in infected twigs, nut shucks, and leaves. The thickened mass of the fungus in the lesions forms a sort of cushion, called a stroma, plural stromata. The spores that produce the first new infections on spring growth of the pecan trees are borne on these stromata. If the early production of spores could be prevented, primary infection of new shoot growth would be decreased considerably, and control of spread later in the season would be easier to achieve. The purpose of the trials was to determine whether application of certain fungicides while the trees were dormant might kill the fungus in the stromata, or at least injure it so as to prevent spore bearing or delay it until the new tree growth had ceased to be vulnerable to infection.

Trials on Nursery Stock

CONTROL of the disease on nursery stock is especially important. On nursery trees, lesions may occur on the trunk and main branches as well as on the smaller branches. Scab-infected nursery stock can become a source of spread in old or new plantings. The shipment of infected nursery stock could be an important means of distributing new strains of the scab fungus, such as the strain reported recently from Mississippi, that attacks the hitherto resistant Stuart variety of pecan.

In March 1956, four materials that had been found promising in field and laboratory tests as contact fungicides for the pecan scab pathogen were sprayed on badly scabbed nursery trees of the variety Burkett, which had just been planted. A knapsack-type sprayer was used. The four compounds used in this experiment were:

- Puratized Agricultural Spray — 7.5% tris (2-hydroxyethyl) (phenylmercuri) ammonium lactate
- Santobrite—75% sodium pentachlorophenoxide plus 13% sodium salts of other chlorophenols
- Stauffer N-521 — 90% tetrahydro-3,5-dimethyl-2H-1,3,5-thiadiazine-2-thione
- Dithane D-14 (nabam) — 19% disodium ethylenebis (dithiocarbamate)

Single applications were made of each of the four materials. In addition, two applications of Puratized Agricultural Spray were made to one group of trees, and another group was left unsprayed.

The production of spores of the fungus on holdover stromata on stems was determined 10 and 112 days

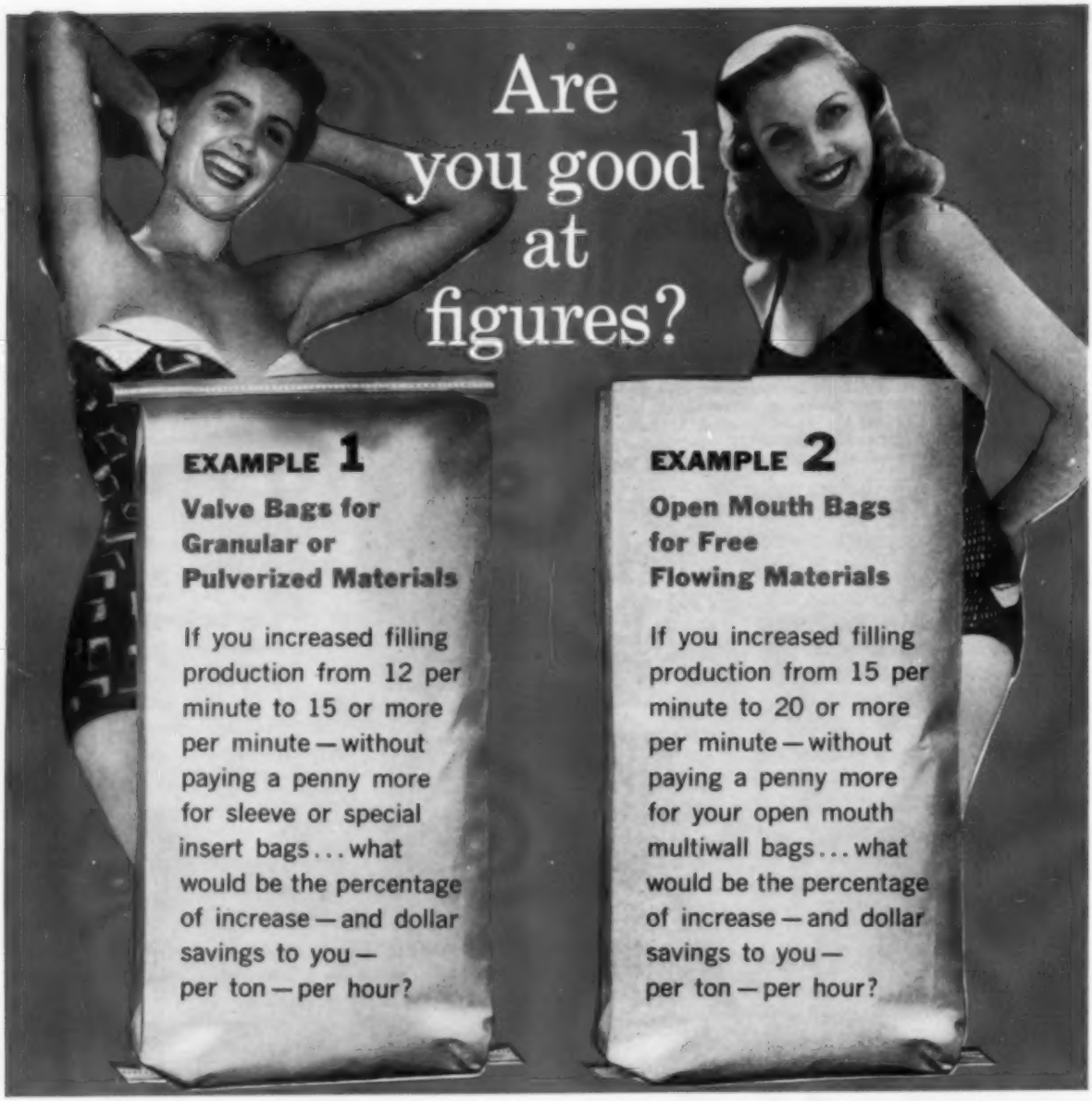
TABLE 1.

Effetcs of application of contact fungicides to dormant nursery trees of Burkett pecan on sporulation of holdover stromata of the scab fungus on stems and on foliation, Stillwater, Oklahoma, 1956.

Contact fungicides and number of applications	Amount of fungicide in 100 gal. of diluted spray material	Trees treated	Average sporulation rating[a] of holdover stromata after indicated period		Nursery trees that foliated
		No	10 days	112 days	Percent
Puratized Agricultural Spray					
2 applications	5 pints	5	0	0	100
1 application	5 pints	7	0	0	100
1 application	2.5 pints	7	0	0.3	100
Santobrite + Standard Dormant Spray Oil No. 1	4.7 pounds + 1 gallon	7	0.1	0.1	100
1 application					
Stauffer N-521					
1 application	2.8 pounds	7	3.7	1.0	86
Dithane D-14					
1 application	1.9 pints	7	1.1	0.6	100
None (Check)	——	4	4.0	2.3	100

[a]Based on a 0-4 scale: 0 = no conidia; 4 = heavy sporulation.

*From *Plant Disease Reporter*, vol. 40, no. 10, Oct. 15, 1956, "Eradication of Pecan Scab on Nursery Trees," pages 870-871; and vol. 40, no. 11, Nov. 15, 1956, "Field Tests of Contact Fungicides for Pecan Scab Control," pages 961-964. By Richard H. Converse.



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after the fungicides were applied. Puratized Agricultural Spray at the 5-pint rate completely prevented spore production (Table 1). Aerial mycelium was present on the stromata after one, but not after two applications of Puratized Agricultural Spray. A fair degree of control was obtained with Puratized Agricultural Spray at the 2.5-pint rate and with Santobrite plus dormant oil. Complete eradication of the pathogen is desirable, however, to prevent the development of a few primary lesions on foliage which could serve as sources of spores for secondary infections. Stauffer N-521 and Dithane D-14 were unsatisfactory in this test.

None of the treatments except Stauffer N-521 on one tree affected leaf development (Table 1). The rate of leaf appearance was independent of treatment.

From this test it appears that complete suppression of sporulation on holdover stromata on dormant pecan nursery trees is possible, provided the correct concentration of a satisfactory contact fungicide is used and good coverage is obtained.

Trials with Mature Trees

MATURE pecan trees of the variety Squirrel not sprayed in 1954, and having active holdover stromata on twigs in March 1955 were used for a field test of contact fungicides in 1955. For all contact-fungicide sprays except one, two applications each of approximately 50 gallons of spray mixture were applied 9 days apart to each tree, and to the ground immediately around it in a circle with a radius of 15 feet. Both sprays were applied in late March before bud-break with a high-pressure hydraulic sprayer. Each treatment was applied to five trees in a randomized-block experimental design.

Seven different spray treatments were used in the test. In all cases where a protectant spray schedule was used, ziram (as Zerlate at the rate of 2 pounds per 100 gallons of water) was used in a 5-spray schedule. The treatments were:

1. No fungicide
2. Corona CM-220 (3 pounds per 100 gallons of water)
3. Ziram only
4. Corona CM-220 (3 pounds per 100 gallons of water) followed by ziram
5. Puratized Agricultural Spray (5 pints per 100 gallons of water) followed by ziram
6. Dowicide G (4.5 pounds plus 1 gallon of dormant oil emulsion per 100 gallons of water) followed by ziram
7. Corona CM-220 (3 pounds per 100 gallons of water) applied to the trees and to the ground around them throughout an entire block of 5 trees, followed by ziram

The chemical composition of the materials used is as follows:

Corona CM-220 — monocalcium meta-arsenite

Zerlate (ziram) — zinc dimethyl dithiocarbamate

Puratized Agricultural Spray—(as above)

Dowicide G—sodium pentachlorophenoxide

Standard Dormant Spray Oil No. 1 —dormant oil emulsion.

The capacity of holdover scab stromata on twig lesions obtained from trees in the test plot to produce spores was determined at intervals during the spring (Table 2). The production and germination rate of spores from twig-lesion stromata from trees sprayed only with ziram were consistently high. Spores from stromata on twigs that had been sprayed with contact fungicides were either absent or failed to germinate. The sporulation on twig stromata was zero throughout the observation period following the applications of Puratized Agricultural Spray. On nut shucks, the effects of the contact fungicides on the production and germination of spores on holdover stromata were similar to those on twig lesions. Control of sporulation on nut shucks generally was not so complete as on twig lesions, however, and on April 14 a high level of spore germination was found in shuck samples from plots sprayed with Corona CM-220.

For the final evaluation of the spray treatments, scab lesions on nuts chosen at random from the lower branches were counted on August 18, 1955 (Table 3). All spray treatments were highly significantly different from the control treatment. When the multiple range test of significance was applied to all randomized-block spray treatments except the control, the three contact-plus-protectant treatments (Corona CM-220, Puratized Agricultural Spray, and Dowicide G, each followed by ziram) fell into a statistically homogeneous group. Corona CM-220 alone and ziram alone fell into a second group, but ziram and the three contact-plus-protectant treatments also constituted a statistically homogeneous group. The three groups are indicated by the brackets in Table 3. The Corona CM-220 ground spray plot adjoined but was not a part of the same experimental design as the other treatments; hence it cannot be compared statistically with the other treatments.

It is noteworthy that the use of contact fungicidal sprays alone re-

(*Continued on Page* 103)

TABLE 2.

Sporulation levels of overwintered stromata of "C. effusum" on twigs of Squirrel pecan sprayed twice with three contact fungicides, Paden, Oklahoma, 1955.

Date	Spraying or rating	Sporulation level[a] of stromata sprayed with—		
		Corona CM-220	Dowicide G	Puratized Agricultural Spray
March 15	First spraying	—	—	—
March 24	Second spraying	—	—	—
March 25	First sporulation rating	4	2	0
April 14	Second sporulation rating	4	14	0
May 4	Third sporulation rating	3	0	0

[a]Level on stromata sprayed only with ziram = 100.

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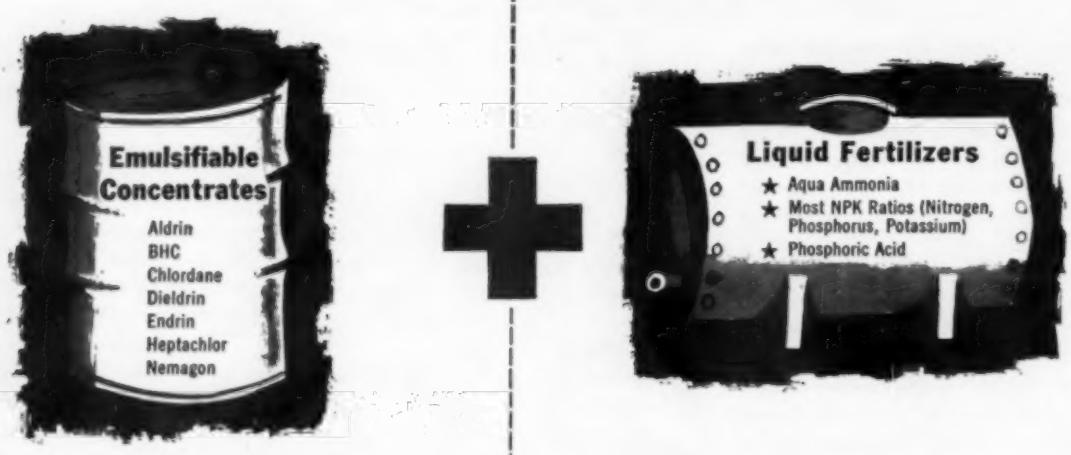

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Surveys Show Bollworms Still Confined; Other Pests High

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head — Plant Pest Survey Section, Plant Pest Control Branch, U. S. Department of Agriculture. His observations are based on latest reports from collaborators in the U.S.D.A.'s pest surveys throughout the U. S.

By Kelvin Dorward

Pink Bollworm Survey

SURVEYS conducted this fall to determine the presence of the pink bollworm show that this serious pest of cotton is still confined to the regulated areas of Louisiana, Arkansas, Oklahoma, Texas, New Mexico and Arizona. Gin trash, green boll, cotton lint cleaner and gin stand inspections through November 30 show the only new counties reporting pink bollworm to be Crawford, Columbia and Sebastian, Arkansas. All of these counties are in the previously established regulatory zone.

In the southeastern states of Alabama, Mississippi, South Carolina and Tennessee, 3,393 bushels of gin trash were examined with negative results. Gin trash examination has been completed also without finding pink bollworm in Missouri. A total of 348 bushels of trash was examined in 6 southern counties. No pink bollworms were found in the 18,124 bushels of gin trash examined during the survey in the San Joaquin Valley of California, which ended November 22. Field inspections of 2,231 green bolls from 2,088 acres of cotton in the southern area of Nevada during the week of October 7 showed no pink bollworm infestation.

During the past season, the pink bollworm developed heavy infestations in irrigated cotton along the Brazos area in Texas, in parts of the El Paso Valley area and in untreated fields of Dona Ana County, New Mexico. Populations in the western third of Oklahoma averaged lower than in 1955, while populations in the central and eastern portions of the state were slightly above normal. Light damage was reported from San Simon, Bowie and Elfrida in Cochise County, Arizona.

Boll Weevil Hibernation Counts

WOODS trash examination to determine the number of boll weevils going into hiberation has been completed in Mississippi. This fall the state was divided into four areas: namely, the lower delta (Sharkey, Issaquena, Yazoo and Humphreys Counties), central delta (Washington, Bolivar, Sunflower, and Leflore Counties), north delta (Coahoma, Tunica, Quitman and Panola Counties) and the hill section (Amite, Madison, Noxubee and Monroe Counties). Ninety samples consisting of two yards of surface trash each were collected from each area with the average number of hibernating weevils found per acre being 2379, 1814, 2516 and 1655, respectively. The state average was 2091 compared with an average of 5054 per acre in the fall of 1955.

Soybean Cyst Nematode Found in Tennessee

THE soybean cyst nematode (*Heterodera glycines*), which heretofore in this country, has only been known to be in a limited area of North Carolina, was reported from Tennessee the latter part of November. A recent announcement from Mr. H. L. Bruer, director of entomology and plant pathology, Tennessee Department of Agriculture stated that the soybean cyst nematode had been found in Lake County, and at the time of the announcement, infested land had been found for approximately two miles south of the original find.

The soybean cyst nematode, which is known to occur in Japan and China, was first found in the Castle Hayne area of New Hanover County, North Carolina. At present, infestations are known to be on about 1,600 acres in New Hanover and Pender Counties, North Carolina. The North Carolina State Department of Agriculture regulates the movement of articles that might carry the pest from infested fields. Cooperative surveys between the Plant Pest Control Branch, Agricultural Research Service, and the State Departments of Agriculture of Tennessee and North Carolina continue. Cooperative surveys are being initiated in soybean growing states in the vicinity of Tennessee.

Aphids Active on Alfalfa

AMONG the cereal and forage insects, perhaps the two most active pests during October and November 1956 were the pea aphid and spotted alfalfa aphid. The pea aphid which had been rather active throughout the 1956 growing season continued to cause concern during the latter months of the year. In Colorado it was determined that the pea aphid was probably the number one pest of the year. High populations in combination with the spotted alfalfa and other aphids were present in late October on alfalfa in the northeastern section of the state, with heavy damage and large deposits of honeydew resulting. In Utah, the pea aphid often in combination with the spotted alfalfa aphid, was heavy on succulent alfalfa in late October and survived the early November cold weather, which included snow, frost and freezing temperatures. Population in the western area of Nebraska continued high into early November. In the central area of Illinois populations of 500-1,000 per sweep were common, and individual alfalfa plants in many fields were killed. During mid-November populations in alfalfa fields of Frederick County, Maryland, still averaged 3-12 aphids per sweep.

The spotted alfalfa aphid continued its spread and damage into the latter months of 1956. Although, in general, populations in Oklahoma continued rather light, counts were up in scattered fields of the central part of the State where green growth was present. Counts in late Novem-

(*Continued on Page* 103)

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FERTILIZER
Views and News

By Vincent Sauchelli

More on Water-Solubility of P_2O_5

WHAT degree of water-solubility can be tolerated in a phosphatic fertilizer for maximal response by crops? To answer this question we should be able first to measure accurately the availability of the phosphate and correlate it with crop response on different soils. In recent years, investigators have been able to evaluate different methods of analysis by means of the radioisotope tracer technique. According to the few published data, only about 50% of the contained phosphorus need be water-soluble, a higher percentage serving only to stimulate early growth without, however, increasing the yield.

Do we know what is the average water-soluble P_2O_5 content of mixed fertilizers sold in the United States? The only data with which I am familiar are those published by Messrs. K. G. Clark and W. M. Hoffman of the U. S. Department of Agriculture in 1952, and Messrs. J. R. Archer and R. P. Thomas of International Minerals & Chemical Co. in 1956. The U.S.D.A. workers reporting on a large number of samples furnished by many state control chemists showed a water-solubility ranging from 48.4% to 84.5%, depending on the kind of mixture and raw materials used. The I. M. C. Co. figures, based on the analysis of 250 samples, showed a solubility range of from 41.8% to 87.1%, the higher figure applying to superphosphates. The general average for the 250 samples was 48.4%. Some research agronomists have indicated that the desirable range for mixed fertilizers should be 40 to 50 per cent.

The fertilizer industry can produce phosphate-containing fertilizers having a range of water-solubility to satisfy the requirements that may be established by agronomic research. On some grades a premium may have to be imposed because of the extra time and effort and the higher quality of materials that may be involved.

In this connection, it would help all around if we had more precise measurements of the correlation between maximal yields and water-soluble P_2O_5. Such information might even help establish tolerances and penalties for the state control chemist and the factory control laboratory. At present, the laws governing the sale of fertilizers do not require a guarantee of the water-soluble P_2O_5. It is possible that some states may in the future require such a guarantee. It is hoped that more accurate methods for measuring availability may be developed by that time.

Another Slant on Nutrient Zinc

REFERENCE has been made in this column to the role of trace minerals in plant and animal metabolism. The reports on deficiencies of trace elements most commonly concern themselves with their direct effect upon the health and growth of the affected organism. A new angle to this problem is indicated in research conducted in the Federated Malay States on the infection of the plantation rubber tree by the disease fungus *Oidium heveae*. It seems that when the rubber tree is suffering from zinc deficiency, it is more susceptible to attacks by this fungus. In other words, the presence of zinc within the tissues of the plant works as a deterrent or systemic poison to the disease fungus. This was proved by a number of ingeniously planned tests.

Something along this line of thinking has been accepted for years in the case of potassium. All the textbooks indicate that the major element, potassium, confers disease resistance to plants. This latest report on the influence of a trace element upon the health and growth of plants serves to remind us that the importance of these vital elements to all living organisms is not in proportion to the amounts present and that the designation "minor elements" may mislead one as to their essential function in life. Undoubtedly the Malayan research will suggest to scientists that the possibility exists for controlling fungus diseases by the application of a trace-element fertilizer. It becomes increasingly evident that the fertilizr industry can and does play an important part in building and maintaining the health and vigor of the nation. Some have speculated that perhaps some forms of heart disease and other human ailments may be due to deficiencies in the diet of some one or more trace elements. Who knows? Only time will tell.

A Reader Inquires About Phosphorus Removal By Crops

This request for information on phosphorus may interest you, too. "Please tell me, a layman, why my dealer carries only fertilizers in which it seems phosphate is present always in larger amounts than the other plant foods? I saw a chart on his wall which shows that all crops listed consumed more of the other plant foods than the phosphate. These two situations don't jibe. The dealer could not convince me with his explanation."

Most industry men know the answer. Most laymen do not. The

chart referred to is similar to many picture diagrams showing the relative amount of each important plant nutrient removed by average weights of commercial crops. They all have a definite limitation, since they are based on *average* crop harvests, which may or may not have been adequately fertilized for, and grown under, optimal soil and climatic conditions. The amount of phosphorus shown as removed by each crop is generally less than that of nitrogen and potassium and frequently also of magnesium and calcium.

Why. then do so many grades of complete fertilizer contain a relatively higher percentage of phosphorus? The layman says the grades seem to have a phosphorus hump in them. He sees 3-12-6, 5-10-5, 4-12-8, 10-20-10, and so on. Why put so much more phosphorus in the fertilizer grade when apparently crops generally consume more nitrogen and potash is a question asked quite frequently by farmers and dealers.

That is a fair question and it deserves a fair answer. The official fertilizer recommendations sponsored by each State Agricultural Experiment Station are the result of long, carefully carried out scientific research. They are not guesses or caprice, but conservative judgments of trained agronomists.

Phosphorus is an essential plant nutrient. The amount required varies with plant species, the native reserves of the soil and certain soil chemical conditions which influence its uptake by plants.

Soils vary in total phosphorus content from about 300 to 2,500 pounds per acre of soil measured to plow depth. Most of this soil phosphorus is present as hard-to-dissolve minerals, soil organic matter, small amounts adsorbed to the surface of colloidal material, and in the soil solution. It can be stated generally that phosphorus is one of the first limiting factors in crop production because the total available amount in soils is relatively inadequate, the amount present being all too often in such slowly available form as to be of little value to the crop in its critical, early stage of growth.

Phosphatic fertilizers are applied to a soil to supply the crop with a sufficient amount of readily available phosphate and to replace the amount removed by previous cropping. The average amount removed per acre varies with the crop, some crops being heavier consumers than others. Usually the phosphorus removed is about two to four-tenths per cent of the dry weight of plants. Assuming that a good average per-acre yield corresponds to 2 to 2½ tons of dry matter, the amount of phosphorus (P) thus removed would be about 10 to 20 pounds, or expressed as P_2O_5 to about 23 to 46 pounds. A really high crop yield might remove as much as 50 pounds of P_2O_5 per acre which is equivalent to 250 pounds of 20% or 110 pounds of 45% superphosphate.

The average application of mixed fertilizer applied for high yields may often contain as much as 3 to 5 times more phosphorus than will be removed by the crop. Isn't that wasteful? is the question. Perhaps, if experience proved that it is not warranted. But both experiment station research and farmer experience have shown that such heavy applications must be made if the goal of high yields is to be reached. Farmers use such amounts primarily because they have learned that it pays.

Let us face it. Admittedly, the crop that is fertilized, that feeds at the first table, does not efficiently recover all of the applied phosphorus. Research has shown that much of the phosphorus applied in the available form is converted to less readily soluble forms after it comes in contact with the chemical agencies of the soil. But these less soluble forms are not lost by leaching: they remain in the soil and supply phosphorus to subsequent crops. These accumulations in time raise the productivity level and permit a more efficient utilization of the applied nitrogen and other nutrients.

Many soils of the Atlantic Seaboard are at present more highly productive as a result of this traditionally high phosphorus fertilization than when the Indians had them. Some of these Eastern soils now have from 5 to 10 times more phosphorus than in their virginal state. Despite this high content, experience amply justifies the continued application of phosphorus as an indispensable factor in the production of profitable, high yields.

The problem is not solved by reducing the hump in the fertilizer ratio: fertilizers will continue to be of the 1-2-1, 1-4-2, 1-3-2, 1-1-1, 1-2-2 type, until we learn how to reduce the fixation of phosphoric acid in the soil and increase the efficiency of phosphorus uptake by crops. Some methods are already known. They comprise: liming mineral soils to a pH of 6.0 - 6.5; incorporating abundant quantities of organic matter in barnyard manures; and using granulated fertilizers. Farmers have proved these practices both practicable and feasible. Getting greater efficiency out of the applied fertilizers by means of these proven practices rather than arbitrarily reducing the amount of phosphorus in the fertilizer grades would seem the preferable way to utilize modern processed phosphates.

Organics: New Angle

"NONE of the nitrogenous organics is slow enough and any virtue a synthetic imitation could offer would be found in greater slowness." Thus did Dr. E. M. Crowther, late director of the Rothamsted Aric. Experiment Station in England, express himself; if the words are not exactly his, the meaning at least is definitely his.

A recent journal item from Great Britain refers to an address by Dr. O. Owen before the Society of Chemical Industry in which the author discusses nitrogen usage in commercial greenhouses; it recalls Dr. Crowther's commentary. This report summarizes the results of a long-time study and gives conclusions at some variance with accepted viewpoints. For example, the results show that contrary to the belief long held by organic enthusiasts, hoof and horn meal is slow-acting while dried blood is quick-acting, it was found that when hoof and horn and dried blood are used at the same particle size no

(*Continued on Page* 113)

Technical
SECTION

Motor Failures Reduced in Fertilizer Plant

By W. B. Gibbs
Smith-Douglass Co., Inc.

THE unusual number of motor failures associated with the manufacture of chemically concentrated fertilizers is attributed largely to the dust-laden and corrosive environments in which they operate. Even protective jacketing hasn't solved the problem and motors continue to fail despite every effort to shield them.

Recurring motor failures at Smith-Douglass Company, Inc., a Norfolk, Va. producer of nitrogen fertilizers, were in part the result of ambient conditions, but another and far more obscure source of trouble was discovered to be the cause of a great number of needless burnouts. Electrically actuated protective devices, in this case magnetic motor starter overload relays, were not tripping properly.

This fact was driven home when the electrical maintenance department of Smith-Douglass Company used a Multi-Amp high current portable test unit to determine whether relays and breakers were in truth performing satisfactorily. The Multi-Amp technique, based on a portable electrical unit which simulates overloads for calibrating trip times, disclosed a large percentage (85%) of miscalibrated starters or protective apparatus in need of repair. The majority of cases required reduction of heater sizes to a level which would permit earlier tripping at dangerous oversurges. With production demands continually driving existing equipment to its utmost, the extra measure of safety arrived at by using the reduced heater sizes determined by the Multi-Amp resulted in a substantial reduction in the number of motor burn-outs, and consequent serious stoppages.

Performance tests are by no means confined to the electrically actuated devices in line, but extend to new units before installation. Heater values recommended by motor manufacturers are often based on "averages" which may apply to the great majority of installations but which, because of the peculiar circumstances of operation at Smith-Douglass, could not be safely assumed to apply. Tests have sometimes revealed that new relays, calibrated with great exactitude in accordance with the manufacturer's recommendation, will not give sufficient protection under the particular set of conditions which affect it.

In principle, the test instrument is a variable high-current power source which produces a primary current in stepless increments from 0 to 500 amperes, depending on the model. Voltages are in inverse proportion. A calibration test is performed by wheeling the instrument to the site of inspection and plugging the device into a convenient 110 volt outlet. The simulated overload requirement is determined; leads are connected between the proper taps on the Multi-Amp and the relay heater. Also, a set of leads is connected between relay contacts and the timer posts on the Multi-Amp. The heater is safely isolated from input. The relay or attendant electrical equipment need not be removed—only a disconnect switch needs to be opened.

The instrument is energized, and in conjunction with an ammeter and stop timer, a precise trip-time evaluation can be made. This can be done before the relay is put on line and periodically after installation. The findings are conclusive evidence of relay performance and for the first time there is assurance that this one area of potential trouble is no longer a factor to contend with in establishing a comprehensive preventive maintenance program.

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Controlling Apple Scab

Compounds of the chlorogenic acid type seem to play an important part in building up resistance to fungi which cause apple and pear scab, reports Dr. D. S. Kirkham of East Malling, Kent, England, research station. Experiments are now being made to find a compound which will be more poisonous than chlorogenic acid but less damaging to the tree.

So far, cinnamic acid has given the best results.

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Greenhead Fly Control

Since 1951, Dr. Elton J. Hansens, Rutgers University department of entomology, New Brunswick, N.J., has been experimenting with various methods of controlling greenhead flies on the salt marsh.

Until the advent of DDT no satisfactory control measures of these important pests of man and animals had been developed. DDT has been used successfully to control adult greenheads in resort areas by aerial application. In New Jersey, however, it has been impossible to use this method because the amounts of DDT required have adverse effects on crabs and other life.

Over a four-year period, Dr. Hansens applied several insecticides in formulations prepared on ground tobacco stems. He found dieldrin most satisfactory. Five percent dieldrin applied from the air eliminated greenhead larvae from the treated marsh for two years but did serious damage to other animal life. Dieldrin at one to two percent did much less damage and reduced greenhead populations for at least a year after application. DDT, aldrin, and BHC similarly formulated gave good initial kills but were ineffective as residuals.

Insects In Stored Grain

Insects can be a real problem in stored grain. Infestations generally start with a few unnoticed insects present when the grain bin is filled. After a month or more these insects may multiply into damaging numbers. Infestations can be controlled by good housekeeping; use of residual sprays, protectants, and if necessary, fumigation. The Food and Drug Administration is establishing tolerances of permissible amounts of insecticidal residues on stored grain. So far, only a few chemicals have tolerances established. It is reasonably certain, however, that if the directions given on the labels are followed, no excessive residue will result. Current information on permissible residues on stored grain is available from county extension agents or land-grant colleges.

"Insect Pests of Farm Stored Grain," Pacific Northwest Cooperative Bulletin No. 15, October, 1956.

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Liquid Fertilizers in Ohio

A question of the value of liquid fertilizer spraying is voiced by H. J. Mederski and G. W. Volk in the Sept.-Oct. issue of *Ohio Farm and Home Research*. In many of the crops tested, their experiments revealed that liquid fertilizer spraying did not increase yields of some of the state's leading crops.

In four experiments with corn a 5-10-5 liquid fertilizer was sprayed on the leaves at rates ranging from approximately two to three gallons per acre per application in from one to four applications. The sprays were applied to corn which had been row fertilized and to corn which had not been fertilized. In none of these expermiments was the yield of corn increased by spraying the leaves with liquid fertilizer.

In tests with small grains, wheat yields were not significantly increased by a single foliar application of a 5-10-5 liquid fertilizer applied to wheat 8 inches tall at rates from two to six gallons per acre. Oats, like wheat, did not yield more when sprayed with a 5-10-5 liquid fertilizer.

The application of two and five gallons of a 5-10-5 liquid fertilizer

sprayed on alfalfa ten days after the first cutting did not increase the yield of second cutting hay.

In experiments with soybeans fertilized at planting with 250 pounds per acre of 0-20-20, the foliar application of two gallons of 5-10-10 made when the beans were 12 inches high and repeated at flowering failed to increase the yield of soybeans.

The results of these studies show that under the conditions of these experiments, spraying the leaves of field crops with relatively small quantities of nitrogen, phosphorus and potassium did not increase crop yields.

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Range Rodent Control

Successful range rodent control through use of poisoned cereal baits scattered by plane is reported in the October issue of *California Agriculture*. In an article titled "Range Rodent Control by Plane," W. E. Howard, B. L. Kay, J. E. Street, and C. F. Walker report that "application of poisoned grain by any custom agricultural aircraft assures that the bait will be well scattered and—while effective in controlling small rodents, —there is no danger of poisoning deer, sheep, or cattle regardless of what rodenticide is used." In the California tests, kernels dyed brilliant colors presented little danger to bird populations.

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Soft Rot On Onions

Bacterial soft rot disease begins in maturing fields of onions, but its presence may go unnoticed until after harvest. The disease is caused by bacteria, which enter the neck tissue through dead or old leaves and progress down one or more scales without passing from one scale to another.

When rot has progressed down between the scales for some time, the diseased bulbs can be detected by gentle pressure. This pressure causes a watery fluid to exude from the neck of the onion.

The disease can be prevented by letting the crop mature well before undercutting. The tops should be allowed to dry as long as possible before the topping operation. Sunburned and bruised bulbs are very likely to rot in storage and should be culled out before bagging.

TO MANUFACTURERS AND DISTRIBUTORS OF FERTILIZERS

This advertisement, appearing in farm publications in Florida, Delaware, Maryland, New Jersey and Washington State, tells farmers, planters and fruit growers what Moly in fertilizer can do in combating soil deficiencies and improving yields. Several firms are already adding Moly to their blends. Write Dept. 43, Climax Molybdenum Company, for more facts about the extra value to your customers and extra profit to you which can result from the addition of MOLY to your fertilizer blends.

In experimental farm studies conducted in Washington State, the yield of alfalfa was increased nearly 40% by adding Moly to molybdenum-deficient soil. The fodder below the white line in the stack at the left indicates yield on moly-deficient soil. Volume above the line indicates increase produced by addition of Moly to soil. Photos courtesy of John Deere, Moline, Illinois.

How alfalfa yield has been stepped up nearly 40% by adding MOLYBDENUM to some acid Washington soils

Application of Sodium Molybdate to Moly-deficient soil, tests show, will result in sizeable yield increases

Scientific tests conducted by Dr. H. M. Reisenauer in Spokane County, Washington, have resulted in greatly increased yields of alfalfa. Investigations that began in 1952 have shown that poor forage yields were caused by Moly deficiency. Correction was made by adding one pound of sodium molybdate per acre. The applications were made in water solution, using a weed spraying outfit.

Other marked advantages result from the use of Moly

When alfalfa is grown in a Moly-deficient soil the plants tend to be stunted and pale green in color. Spots develop between the leaf veins, often spreading to affect the entire leaf. Such leaves finally die and fall off. When other conditions are favorable, these deficiency symptoms are corrected by the addition of available Moly to the soil, resulting in greater yields and more vigorous growth.

Tests here and abroad show that all crops need Moly

Thorough tests, made over the last 15 years, both in this country and in many foreign areas, have shown conclusively that all crops need Moly in a form which can be assimilated readily by the plant. If available Moly is not present in the soil in sufficient quantities, then it should be added either alone or combined with fertilizers.

Now is the time to find out whether your own soil is deficient in Moly

Specific experiments with dozens of different crops, ranging from citrus to sugar beets, proved that Moly deficiency exists in soils in many areas in the United States. If your own soil lacks available Moly you may be getting much lower yields than you should. Get in touch with your County Agent. He will be glad to help you set up test plots. Write for our bulletin: "Testing for Molybdenum Deficiency." Address Dept. 43, Climax Molybdenum Company, 500 Fifth Avenue, New York 36, N. Y.

MOLY CAN BE ADDED TO ANY FERTILIZER BLEND

When ordering fertilizer you can always specify that molybdenum be included as an additive.

CLIMAX MOLYBDENUM

WASHINGTON Report

by
Donald G. Lerch
Cornwell, Inc., Washington, D. C.
(Agricultural Chemicals Washington Correspondent)

THE big question at the beginning of this year is, how soon will the pesticide industry reach a billion dollars in sales? The question is definitely when, and not whether. Those on the bullish side feel that industry growth to date has been at a slow rate compared to what's ahead for the future.

Bolstering the expected growth in the industry, is the investment of millions of dollars in research facilities by a large group of companies. Another factor is the "hybrid vigor" that some say has been injected into the business by the so-called new comers. By the same token, manufacturers of the old stand-by family of arsenic compounds are also increasing their investment in research — thus making a broad base for industry advancement.

Conservatives, however, hold back a bit on the basis that rosy predictions are made after the best year in the industry's history, where sales are placed at 25 percent ahead of the year earlier with the final tabulations still to come in. Conservatives also remind the industry that insect infestations were unusually heavy in many of the largest consuming areas of the country, and this, together with large government investments for specialized control programs, should be given a major share of the credit.

* * * * * *

Whichever way you look, here are some of the forces that will be at work in 1957 that probably will have a direct bearing on your business. First, net farm income should be about 5 percent higher than during 1956. This increase will not be across the board, but significantly it should be the first improvement in farm income during the last five years in which farm prices fell by 23 percent. If psychology is a factor in the farmer's purchasing, the fact that his income is up somewhat should help sales. This increased farm income, however, will not come from increased marketing. Rather it will come largely because of direct government payments for soil bank participation and other conservation programs. The total amount of government expenditures for various agricultural price propping ventures will be at least a billion dollars larger this year than last.

Out of all the complexity of the government's new farm program, reports from the field show that the farmer is looking at the whole thing in very simple terms— how can I make the most money and at the same time maintain the fertility of my land. Pesticides and fertilizers both will be used by farmers as a means of fighting the continuing increase in production costs. Since the 1947 to 1949 period, production costs on the farm have gone up fifteen percent. This has been partially offset by lower feed costs. Nonetheless farmers are becoming more willing to invest money for those production tools that lower the per unit cost of production. The fertilizer industry's continuing campaign on this point seems to be taking hold, and fertilizer sales this spring may demonstrate how successful their campaign has been.

Another favorable prospect on the domestic scene is the continuing development of new markets for materials by the pesticide industry. New systemics, particularly some for use on cotton, plus other uses, are multiplying the opportunities for sales. Important, too, is the opportunity to sell more farmers on the value of any one pesticide thereby opening the possibilities for him to become a user of a large family of materials.

Export managers are hopeful they can reverse the slight dip in exports, and some of them reason that given more support by top management, they can hold their own in fierce foreign competition just as their colleagues in the domestic market battle heavy odds to maintain their sales. With more and more companies eyeing the export market, competition is becoming very keen and may well become more so. What's more, export managers are reporting that a larger investment is now required in order to do business overseas. No longer can a company have a man covering a dozen or so companies, merely taking orders. Foreign buyers are demanding service, and getting it. If they don't get it from the United States, they get it from abroad, especially German firms. However, as sales policies abroad reflect the same care and supervision as those in the domestic market, exports may well increase.

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Charles Poucher, Director of the Florida Mediterranean Fruit Fly Program, at Lake Alfred, may well be attending a victory celebration later this year. In my interview with him in his Florida office, he said there's every reason to believe that the Med. fly will be "whipped this spring." He hastened to add that this doesn't mean the fly will be eradicated by this time, but that for purposes of the commercial growers, the fly will be under control throughout the state.

Broward County is the only one remaining on the East Coast where major spray operations are continuing. This county, together with ten others largely on the West Coast, is all that's left of what at one time was a 28-county area. Only 67,000 acres are now under intensive scrutiny, compared to more than ten times that number which were covered with several applications of insecticide last season.

One of the reasons for Poucher's confidence is what he calls a "highly competent, well-trained staff." He feels that the main problem was to get together a staff of men who could carry out the program effectively. This has now been done. The other problem, in his opinion, was to get the pesticide material at the right place at the right time. Spray operations jumped from zero to such a tremendous intensity, that there was no margin of safety with respect to supplies of material. When a train developed a hot box or a shipment was missent — a genuine crisis developed.

At the moment, supplies of chemicals are on hand, trained specialists are in the field, and the experience of the past year is serving to make 1957 a year of victory.

Over 50,000 traps are spotted throughout the state. When a Med fly is caught, sprays are applied in a square mile area surrounding the trap, often within a matter of hours. The highest recent count, according to Poucher, was 84 flies in one trap. This was in an isolated grove, and of course the complete spray treatment was given the area. For the most part, traps that are showing flies, are turning up only one or two at a time. The morning that I talked to Poucher, three flies had come in. Each fly means the launching of a new spray program, taking over 40 days to complete.

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This spring will also see the launching of a renewed campaign

(Continued on Page 99)

Colorado Meeting Jan. 25

The Colorado Agricultural Chemicals Association will hold their annual meeting January 25th at the Cosmopolitan Hotel, Denver. New officials for 1957 will be announced at the coming meeting.

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Texas Fertilizer Test

A fertilizer test for the next crop year has been started on the B. I. Barnes farm on Chapman Ranch in cooperation with the Nueces County, Texas, extension service and Mathieson Chemical Co., Corpus Christi.

R. E. Nolan, county agricultural agent, said that three plots of three acres each have been treated with varying amounts of 13-39-0 fertilizer. On one plot, 320 pounds of 12-39-0 were applied to the acre; on another plot, 480 pounds of fertilizer were applied; and on the third plot, 640 pounds were applied.

This year's tests will use larger quantities but only the one type of fertilizer.

Research On Baldwin Spot

Two statements, "exact cause unknown" and "effective control unknown," must still be used to summarize research on Baldwin spot of apples, a presumably nutritional disease that has been studied for several years at the Connecticut Agricultural Experiment Station, New Haven.

According to Philip Garman of the station, studies so far indicate that unbalanced mineral ratios have a profound effect on Baldwin spot in Connecticut-grown apples. Evidence points to calcium as the critical element and the unbalanced condition seems to lie between calcium and magnesium, or between calcium, on the one hand, and magnesium plus potassium on the other.

"Efforts to cure the trouble have been partly successful," Dr. Garman finds, "through application of calcium salts as sprays and injected into the soil. Much more needs to be done, however, especially with trees of unusual susceptibility."

Mineral balance as related to occurrence of Baldwin Spot in Connecticut is discussed by Dr. Garman and W. T. Mathis in Bulletin 601 of the Connecticut station. Single copies are available from the station at Box 1106, New Haven 4.

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Butterfly Dodges A Virus

British plans to wipe out millions of destructive butterflies with a new type of virus disease developed in that country have been defeated by an entire lack of cooperation on the part of the butterflies. They flew elsewhere.

The object of the insecticidal exercise was the Cabbage Whites that breed in Britain freely, and even more freely in the rest of Europe.

In the last five years virus researchers have developed various polyhedral diseases which are caused by sub-microscopic virus organisms and are highly infectious among insects. Quantities of the virus were prepared early this year in the hope that the first broods, native or continental, could be infected and used to spread the disease.

Arcadian® News

Volume 2 — For Manufacturers of Mixed Fertilizers — Number 1

NEW—FROM NITROGEN DIVISION

Pelleted Ammonium Nitrate Now Produced at Hopewell

ARCADIAN® Ammonium Nitrate, containing 33.5% nitrogen, is the latest addition to the complete line of nitrogen products now being supplied to the fertilizer industry by Nitrogen Division, Allied Chemical & Dye Corporation.

This popular nitrogen fertilizer is manufactured in modern facilities recently constructed by Nitrogen Division adjacent to its Hopewell, Virginia, plant. The new installation will receive its raw material, ammonium nitrate solution, by direct pipeline. Large-scale production will help to fill heavy demands without excessive storage.

ARCADIAN Ammonium Nitrate is pelleted in a huge 175-foot tower, and is coated with diatomite to help maintain top quality and free-flowing condition through bagging, shipping and delivery to you and your customers.

The location of the new ARCADIAN Ammonium Nitrate production facilities at Hopewell assures economical shipment to fertilizer-consuming areas in many states throughout the eastern part of the country. When you need Ammonium Nitrate, contact Nitrogen Division, Hopewell, Virginia. Phone: CEdar 9-6301.

Air Blast Guns Speed Roadside Fertilization

FAST, LOW-COST SPREADING OPENS NEW MARKETS IN HIGHWAY DEPARTMENTS

Air blasting pelleted fertilizer onto roadside turf is the new, labor-saving, low-cost way to fertilize grass for erosion control and improved appearance of rights-of-way. Two men with two guns and an air compressor, in addition to truck and driver, are all it takes to spread granular fertilizer this easy way.

Using the newest method, fertilizer bags are loaded in one layer. Each man stabs a bag at a time with a special point attached to a hose leading to the gun, points the gun at the roadside, and turns on the air pressure to blow the fertilizer onto the turf. There is no heavy work dumping bags, or even opening them. And no heavy water tank for liquefying the fertilizer needs to be filled and hauled.

Adapted from sand-blasting equipment, the guns are now in use by several highway departments. Early models of air blast guns required the men to open the bags. With the newest designs, the men just stab the bags and shoot!

Greater sales of pelleted and granular fertilizer to highway and turnpike authorities can now be expected. It will pay you to see your local highway officials. The present road network, plus 41,000 miles of federal highways now being planned, provide a big market.

This two-man highway crew is preparing to fertilize roadside turf with the help of new air blast guns.

Once over doesn't end the market, since roadside turf needs steady maintenance. In Maryland, where roadsides have been fertilized for some time, officials figure that fertilizer is needed every other year to keep turf in good condition.

Here's MORE SELL for your FERTILIZER

Now appearing in January issues of farm magazines, this powerful, full-page, two-color advertisement emphasizes your strongest sales point to more than 3½ million farm magazine readers. It leads off the 1957 series of a continuing campaign conducted by Nitrogen Division in behalf of the entire fertilizer industry. Like previous ads, it points out that every acre produces more profit with more fertilizer.

It also shows how fertilizer cuts down the zooming costs for land, labor and machinery per bushel of crop yield. That's why fertilizer pays off for farmers even more than before. In all these advertisements, farmers are advised to "see your fertilizer dealer." Nitrogen Division would be pleased to hear your reactions to this service program, in order to make it work harder for *you*.

Bringing EXTRA ACRES to your farm

Every truckload of fertilizer you buy brings the crop-producing power of extra acres to your farm without the cost of extra land.

Take corn land, for example. When you use enough extra fertilizer to make 80 acres produce the yield 120 acres would ordinarily produce, it's like adding 40 acres to your farm without costs for land, taxes, labor, machinery, seed and insecticides.

You invest more in fertilizer, but you greatly reduce per-bushel production costs. Here's how it works, based on actual results on good corn land in 1956:

$600 worth of fertilizer
produced **8,580 bushels** on **120 acres.**

$1,640 worth of fertilizer
produced **8,480 bushels** on **80 acres.**

All costs, including fertilizer, for the 120 acres were $7,040 and $6,336 for the 80 acres. With corn at $1.10 per bushel, the 80 acres produced approximately the same yield and $594 more profit than the 120 acres.

Fertilizer costs a lot less than land. More fertilizer per acre can help you produce your usual total yield of corn on fewer acres at greater profit, enabling you to put more land into the soil bank or other crops. This makes dollars and *sense*. Get the advice of your county agent and your fertilizer dealer.

NITROGEN DIVISION ALLIED CHEMICAL

The fertilizer industry serves the farmer. Nitrogen Division serves the fertilizer industry as America's leading supplier of nitrogen, the growth element in mixed fertilizers. Nitrogen Division, Allied Chemical & Dye Corporation, 40 Rector St., New York 6, N.Y.

Fertilizer Grows Farm Profits

Greater Use of Fertilizers Builds Bigger Crop Profits from Irrigation

The farmer who digs an irrigation well or who starts pumping water from streams or ponds is a good prospect for more fertilizer. And irrigation is growing fast, even in the so-called humid Eastern states, according to the Agricultural Research Service of the U. S. Department of Agriculture.

Most years irrigated crops out-yield dryland crops by a big margin. Even in areas where rainfall is enough to mature good crops the better timing of irrigation often increases yields. Naturally, it takes more plant food to produce these bigger yields consistently. Good farming calls for a greater tonnage of fertilizer when irrigation water is available.

Farmers now water 30 million acres of land per year—nearly one-tenth of the U. S. harvested crop acreage. Western states already irrigate a large fraction of the land for which water is available. Growth in the East is now rapid. In 1956 some states irrigated twice as many acres as the year before.

Pasture and grass irrigation takes the acreage lead in the East, while vegetable crops show the greatest income increase per acre. Tobacco irrigation in North Carolina has doubled each year since 1951.

The more water available, the more fertilizer crops can use effectively. As irrigation grows, it builds concentrated fertilizer markets.

Fertilizer Rejuvenates Corn Land Unfertilized For Seventy-Eight Years

Good soil worn down to 29-bushel corn yields by 80 years of continuous cropping without fertilizer got a new lease on life with the addition of plant food in 1955-56. This is the report of University of Illinois agronomists on the famed Morrow plots—the nation's oldest soil experiment test.

Since 1876, the check plot received no fertilizer. Yield was 29 bushels per acre in 1956, and averaged only 22 bushels from 1944 to 1955.

Continuous corn unfertilized until 1955 and 1956, when it got heavy doses of lime, nitrogen, phosphorus and potash, yielded 113 bushels in 1956, and 86 bushels in dry 1955.

Not all run-down soils can be brought back fast, the Illinois agronomists point out. These plots were on originally deep, fertile soil that has kept some of its good physical condition.

Fertile Pasture Strips Make Better Fire Lanes

Well-grazed pasture strips make good, low-cost fire lanes in Southeastern woods. North Carolina uses 18-foot wide sod strips. A combination of legumes and grass, well-fertilized for a good stand, provides fine pasture and green, non-flammable cover. The sod also makes a good base for travel by fire-fighting equipment.

INDUSTRY News

Skaptason Joins Spencer

Spencer Chemical Co., Kansas City, Mo., announced recently the employment of Dr. Joseph B. Skaptason as agricultural products development manager, with offices in Kansas City.

J. B. Skaptason

In this capacity he will manage the field development of new agricultural chemicals resulting from Spencer's research program and assist in the development of the company's long range plans in agricultural chemicals. Dr. Skaptason was formerly director of new product development in the agricultural division of Pittsburgh Coke & Chemical Co.

A native of Winnipeg, Manitoba, Canada, Dr. Skaptason received a Ph.D in Plant Pathology from Cornell University in 1940. From 1941 to 1945 he was employed by Naugatuck Chemical Division of U. S. Rubber Co. He served as assistant sales manager for John Powell and Co., Inc., New York, from 1945 to 1948 before going to Pittsburgh Coke & Chemical Co.

S. W. ESA Plans March Meet

The Southwestern Branch of the Entomological Society of America has announced plans to hold its fifth annual meeting at the Gunter Hotel, San Antonio, Tex., on March 11 and 12. Paul Gregg of the Klaus-White Co., San Antonio, will be the chairman of the committee on arrangements for the meeting and should be contacted if exhibit space is desired.

•

Chemway Acquires Carac

Chemway Corp., New Brunswick, N. J., last month acquired the Carac Corp. of Freeport, N. Y., a manufacturer of insecticides, fungicides, herbicides, and fertilizers for home garden use.

Chemway has no immediate plans for changing the operations or organization of Carac. Carac was described as a pioneer in developing a method of applying garden chemicals through a spray device attached to an ordinary garden hose, thus simplifying the task of the home gardener.

•

Shift Garden Supply Show

A change in the time and place of the 16th National Garden Supply Show was announced recently. Previously scheduled for Kingsbridge Armory in the middle of January, the show will now be held in the New York Coliseum on Feb. 17, 18, and 19.

The switch was necessary in order to provide adequate facilities for the crowds of garden supply dealers expected to attend the short course in retail sales management. The course will be held Feb. 16 in the Grand Ballroom of the Park Sheraton Hotel. Nearly 800 dealers attended the same course at the mid-west show in Chicago.

More than 5,000 dealers and distributors are expected to attend the national show, which is open only to this trade.

•

Rankin Asst. to Commissioner

W. B. Rankin, was recently advanced to the post of assistant to the commissioner of the Food and Drug Administration. Frank MacFarland succeeds Mr. Rankin as assistant to the director, Bureau of Biological and Physical Sciences.

W. B. Rankin

•

NPFI Against Elemental P,K

The Executive Committee of the National Plant Food Institute adopted a resolution last month which "looks with disfavor" on the proposed change in reporting the phosphate and potash content of fertilizers in the elemental rather than the oxide form. Action by the committee was taken following a poll of the Institute membership, which showed that 67 per cent opposed changing the present method, and 17 per cent were in favor of the change. 16 per cent favored a neutral position.

•

Shell Agricultural Sales Up

Agricultural chemical sales of the Shell Chemical Corp., New York, were the highest in the past 11 years, according to a report issued by the company which cited the opening of

Columbia-Southern ammonia is used in agriculture for direct application, aqueous solutions, and for compounding water soluble fertilizers such as ammonium nitrate, ammonium sulfate, sodium nitrate and potassium nitrate.

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Columbia-Southern customers are accustomed to fast, efficient, courteous service

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COLUMBIA-SOUTHERN CHEMICAL CORPORATION
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY
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new markets and an intensive development program as factors bringing about the increase.

Two new products finished their first year of sale in 1956. Nemagon soil fumigant sales increased in a number of regions and allyl alcohol sales rose in the Southwest, particularly for use on cotton.

New labels accepted by the Department of Agriculture on aldrin and endrin expanded the uses of both insecticides on agricultural crops, the report said. Aldrin may now be used aginst 80 insects on 77 different crops, and endrin against 46 insects on 12 crops.

•

Nitrogen Plant Finish Near

The new nitrogen products plant of U. S. Steel's Columbia-Geneva Works near Provo, Utah, is more than 90 per cent complete and is expected to be operative this month.

The plant will produce more than 70,000 tons annually of ammonium nitrate, anhydrous ammonia, and nitric acid for the farm fertilizer, explosives, and chemicals industries of the West. The facility is unique in that it employs the secret Montecatini, low temperature process developed in Italy.

Gordon Bywater is superintendent of the unit which will employ some 135 persons. The only such facility in the integrated steel industry on the North American continent, the Columbia-Geneva works utilizes coke oven gases for the manufacture of the nitrogen products.

Completion of the unit adds the last needed ingredient to Utah's industrial-chemical picture. The area already has full supplies of sulphuric acid, phosphate materials, potash, and other minerals.

•

West End Exhibits Plant

Representatives of the pulp, paper, and glass industries of California and the Pacific Northwest were guests of the West End Chemical Co., Oakland, in a tour of the company's soda ash manufacturing plant at Westend, Calif., recently. The group was escorted through the new plant and chauffered to West End's new limestone quarry.

Bradley & Baker Salesman

Bradley & Baker, N. Y., sales representatives and distributors of fertilizers and feeds, has named A. L. Wigger as a field salesman to be based in their St. Louis office. Mr. Wigger was formerly associated with Olin Mahieson Chemical Corp. and the agricultural chemicals division of Pittsburgh Coke and Chemical Co.

•

Prentiss Gets Sales Rights

Prentiss Drug & Chemical Co., Inc., New York, has acquired exclusive sales rights to "Meelium" deodorant, it was announced recently by John Stoddard, vice-president.

Meelium was one of the first true deodorants offered to aerosol fillers, according to the announcement, and one of the few products available that has been studied toxicologically. Used as recommended, it has the remarkable property of destroying most organic and inorganic odors associated with humans, animals, foods, etc.

•

Diamond Transfers Clary

Oscar E. Clary, plant manager of the Richmond, Virginia Plant of Diamond Black Leaf Co., Cleveland, since March, 1955, has been named to a similar post at the firm's Louisville, Kentucky Plant.

Mr. Clary's successor at Richmond is Julian R. Trocki, who has been assistant plant manager of the Newark, New Jersey Plant of Diamond Alkali Co., an affiliate organization, for the past two and a half years.

•

NPFI Active in Chicago Meets

The National Plant Food Institute played a prominent role in a series of agricultural meetings held in Chicago, from Nov. 23 to 29.

C. T. Prindeville, president of the Institute, gave a welcome talk at the Institute-sponsored annual banquet for the National Association of Television and Radio Farm Directors, Nov. 25.

Louis H. Wilson, secretary and director of information for the Institute, was elected to a 3-man Associate Member Advisory Committee to work with officers and the executive committee of NATRFD. Mr. Wilson also will head the Steering Committee for the NATRFD 1957 Spring Meeting to be held in Washington, D. C.

Mr. Wilson was elected president of the Agricultural Relations Council at its annual meeting Nov. 29. This group is an organization of key professional agricultural public relations personnel.

Delbert L. Rucker supervised an Institute-sponsored exhibit of the organization's activities at the annual meeting of the American Society of Farm Managers and Rural Appraisers Nov. 25-27.

•

Wash. Applicator's Course

The second annual short course for Washington ground applicators was held at Puyallup, Wash., on Nov. 29 and 30. Ground applicators from all parts of the state, as well as nurserymen and grounds-keepers for golf courses, cemeteries and similar areas, attended the school which was sponsored by the State College of Washington, the Washington Assn. of Ground Sprayers, Inc., and the Washington State Department of Agriculture.

Among the lectures presented were: "Fertilizers and Soil Conditioners" by Dr. C. B. Harston, extension soils specialist at Washington State; and "Herbicides" by Henry Wolfe, extension weed specialist.

Dr. H. S. Telford, chairman of the Washington State college department of entomology, spoke on the Miller Law. David H. Brannon, WSC extension entomologist, discussed the literature guides to insect control and Dr. William M. Upholt, Senior Scientist, in charge, U. S. Public Health Service, Wenatchee, Wash., talked on "Safety of Pesticides."

•

Shell Appoints Hughes

The Shell Chemical Corp., New York, recently announced the appointment of H. E. Hughes as manager of the company's Denver plant. J. W. Hyde has assumed Mr. Hughes' former position as superintendent of the company's Houston plant.

C.S.M.A. Discusses Labeling, Toxicological Problems

A PANEL discussion giving "Answers to Labeling, Regulatory, and Toxicological Problems" was one of the features of the meeting of the Insecticide Division at the 43rd annual meeting of the Chemical Specialties Manufacturers Association at the Mayflower Hotel, Washington, D. C., Dec. 3-5. The panel discussion, moderated by E. J. Campau, Standard Oil Co. (Indiana), Chicago, Ill., was a principal feature of the Dec. 4 session of the Division.

Panel members included W. G. Reed, Pesticide Regulation Section, ARS, USDA, Washington; S. C. Billings, Assistant to the Chief, Pesticide Regulation Service, USDA; C. H. Jefferson, Production Services, Plant Products Division, Canadian Dept. of Agriculture; and F. J. McFarland, Bureau of Biological and Physical Sciences, FDA.

Mr. Reed declared that the entire registration problem could be speeded up by a more even dispersal of registration applications. He pointed out that the period from January to June is the heaviest, and advised that "greater care taken in preparation of registration applications would speed up the process."

In answer to a question on whether or not there were restrictions on the total number of toxicants in any particular pesticide, Mr. Billings declared that there were none. "The more toxicants, however, the more time it will take to study them," he said. "Ingredients which do not contribute only serve to complicate the situation."

Mr. Jefferson reported that in Canada no pre-set degree of sensitivity to pesticides has been determined, but that complete toxicity data is required on each pesticide. "We consider that use of data on related chemicals is of little use in measuring effects of pesticides because slight molecular differences may result in marked variations in effect."

J. H. Fales, ARS, USDA, Beltsville, Md., reported on results of tests conducted by himself, O. F. Bodenstein, and Morton Beroza at the Entomology Research Branch, Beltsville, on 3,4-methylenedioxyphenyl acetal as a synergist for pyrethrins and allethrin against house flies, mosquitoes cockroaches, and Japanese beetles. The new synergist (which will be manufactured by Shulton Inc., Clifton, N. J. under the name "Sesoxane") caused a high knock down and mortality rate when used as a synergist for pyrethrins.

The new synergist will be the subject of an article in the February issue of *Agricultural Chemicals*.

•

Back Change In Utah Law

A proposal to change Utah's fertilizer law is backed by representatives of that industry, farm groups, the State Department of Agriculture, and other groups, according to Dr. Paul D. Christensen, extension soil conservationist at Utah State Agricultural College.

Dr. Christensen said that under the proposed change, fertilizer manufacturers would be required to state on fertilizer bags the guaranteed minimum percentage of actual plant nutrients. Under the present law, manufacturers already are stating the minimum percentage of nitrogen.

•

Yates To Head New Firm

Richard T. Yates, formerly manager of the agricultural chemicals division of the Hercules Powder Co., Wilmington, Del., naval stores department, has been elected president of the newly-formed Hawthorn Chemical Corp., Louisiana, Mo.

The new company is jointly owned by Hercules and Imperial Chemical Industries, Ltd., of Great Britain and will manufacture methyl mathacrylate, a chemical used in the production of plastics.

Richard T. Yates

Ark. Plant Food Pres.

R. M. Morehead of the Olin Mathieson Chemical Corporation's North Little Rock, Ark. unit was elected president of the Arkansas Plant Food Educational Society. He succeeds William Dunklin of the Planters Fertilizer Company, Pine Bluff, Ark. Other incoming officers are Joseph Wepfer, El Dorado Fertilizer Works, El Dorado, Ark., vice president, and L. A. Dhonau, Arkansas Plant Food Co., North Little Rock, who was re-elected secretary-treasurer.

•

Stewart Is 7th AAI Head

Fred M. Stewart, vice president and general manager of Agricultural Ammonia Service, Inc., Santa Paula, Calif., became the seventh president of the Agricultural Ammonia Institute on Jan. 1. The 39-year-old Californian is the first Westerner to head the AAI — the national trade association of the anhydrous ammonia industry. Mr. Stewart succeeds Maj. Gen. Ralph H. Wooten of Mid-South Chemical Corp., Memphis, Tenn.

•

Emulsol Names Raven

Arthur O. Raven has been appointed sales manager of the Emulsol Chemical Corp., a division of Witco Chemical Co., New York.

Formerly assistant sales manager, Mr. Raven joined Emulsol in 1953 as sales office manager and assistant to the executive vice president. Prior to this he had been a technical sales representative for Abbot Laboratories.

•

Coastal Awards Contract

The Coastal Chemical Corp., Baltimore, has awarded a contract to the Fluor Corp., Ltd., Los Angeles, to design, engineer, and construct a phosphate fertilizer plant at Pascagoula, Miss. Construction will begin in April.

New Cyanamid Division

Formation of a new division of American Cyanamid Co., which will be known as the Farm and Home Division, and will integrate much of the company's agricultural product development and sales, was announced last month by K. C. Towe, president.

The new division was formed by the transfer of the Animal Feed and Food Industry Departments from the Fine Chemicals Division, the transfer of veterinary product sales from the Lederle Laboratories Division, and the inclusion of some agricultural chemical products.

Simultaneously, the Agricultural Chemicals Division of American Cyanamid Co. has been redesignated the Nitrogen and Allied Products Division, and will retain jurisdiction over the bulk sales of fertilizers, insecticides, and mining chemicals, Mr. Towe said. F. S. Washburn will be general manager of the Nitrogen and Allied Products Division.

The Farm and Home Division emerges as a step in the continuing program of implementation and modification of Cyanamid's organizational setup, and combines the product development and marketing facilities of various departments now engaged in agriculture.

Becoming operational Jan. 1, this division will market antibiotic, vitamin, and medicated feed supplements for the feed manufacturing industry, and will sell a wide line of veterinary products, including vaccines, serums, antibiotics, and other disease suppressors. It will also sell packaged insecticides and other agricultural chemicals.

PCA Appoints Lenhart

The Potash Company of America, Carlsbad, N. Mex., has announced the appointment of Robert B. Lenhart as sales representative for the Northeastern and Canadian territory. He succeeds F. Edward Smith, Jr., who is now in the company's Washington office. Mr. Lenhart will make his headquarters at Fairlawn, N. J.

•

ACS Elects Doty, Haller

Dr. D. M. Doty, has been elected chairman of the American Chemical Society's Division of Agricultural and Food Chemistry for 1957. Dr. Herbert L. Haller, assistant chief of the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington, D.C., was chosen as chairman-elect, and Professor Frank M. Strong of the University of Wisconsin was renamed secretary-treasurer.

•

U.S.I. Names Byck

Lawrence C. Byck Jr. has been named manager of heavy chemical sales for U. S. Industrial Chemicals Co., Division of National Distillers Products Corp., New York. He will have responsibility for sales of heavy chemicals, including nitrogen products and sulfuric acid.

Mr. Byck will also have responsibility for sales of phosphoric acid when U.S.I.'s new wet-process phosphoric acid plant is completed. This plant, located in Tuscola, Illinois, is expected to be on-stream this month.

•

Oldbury Expanding Plant

The Oldbury Division, Hooker Electrochemical Co., Niagara Falls, N. Y., is expanding its sodium chlorate plant near Columbus, Miss. The enlarged plant will be completed in early 1958 and will bring the total investment value there to approximately $6 million.

This is the second of two expansions since the plant went into production in 1954 and an additional 5000 tons of sodium chlorate per year will now be made available, raising the total annual capacity to 22,000 tons.

Carbide Buys N. C. Farm

Union Carbide and Carbon Corp., New York, has exercised an option to purchase a 142-acre farm near Raleigh, N. C., which will be used for experimental work on agricultural chemicals.

The farm will be used immediately by Carbide and Carbon Chemicals Co., a division of the corporation, to test Carbide's newest Crag brand synthetic pesticides — weed killers, fungicides, and insecticides.

•

New Monsanto Tech. Service

A technical service group, including specialists in all phases of operation of fertilizer plants, has been formed as a part of the sales organization for agricultural chemicals in Monsanto Chemical Company's Inorganic Chemicals Division. Tom K. Smith Jr. is divisional director of marketing, and William R. Bone of St. Louis is manager of the service group.

The group was organized following the integration in the division of the selling responsibility for various forms of phosphorus, and the line of nitrogen products which came with the merger with the Lion Oil Company.

Those in the new group include two former fertilizer plant managers and two research specialists in the field. In the group in addition to Mr. Bone are Robert W. Lassiter of El Dorado, Ark.; S. D. Daniels of St. Louis; Dr. Edwin Roth of Anaheim, Calif., James M. Seymour of Collinsville, Ill.; J. Howard McNeill and Nicholas L. Redding of St. Louis.

•

Shell Nematology Workshop

The Shell Chemical Corp., New York, has announced that their Shell Nematology Workshop will be held at the Biltmore Hotel in New York on Jan. 16 and 17. The purpose of the conference is to make available the latest information on nematodes and their control through soil fumigation.

The conference will be staffed by leading nematologists from the U. S. D. A. and State Agricultural Experiment Stations. Among the lecturers will be A. L. Taylor, head of the nematology section, USDA, and Dr. W. F. Mai, of Cornell University.

•

Chemagro Plans New Plant

Chemagro Corp., New York, has announced plans to establish a plant to manufacture agricultural chemicals. The plant will be built in the northeast industrial district in Kansas City, Mo.

High Speed Reduction to Micron Sizes — No Attritional Heat!

An ideal Grinder for the production of Insecticide Compounds from DDT, Aldrin, Dieldrin, BHC, etc.

The increased surface area from this type of grinding means greater bulk, for better dispersion and wettability, requiring less amount of wetting agent.

Production Model (15 in. diameter grinding chamber)

Laboratory Model (2 in. diameter grinding chamber)

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Look at the record! 30 inch model reduced titanium dioxide to 1 micron and finer at solid feed rate of 2250 lbs. per hr. 24 inch model reduced DDT (50%) to 3.5 average microns — 1200-1400 lbs. per hr. 8 inch model reduced Procaine—Penicillin—to 5 to 20 microns—up to 20 lbs. per hr. Couldn't you use milling performances like these?

No moving parts. The particles grind each other. High-speed rotation and violent grinding impact of particles are caused by jets of compressed air or steam at angles to the periphery of the shallow grinding chamber. There are no problems of attritional heat. Centrifugal force keeps over-sized particles in the grinding zone. Cyclone action in the central section classifies and collects the fines for bagging.

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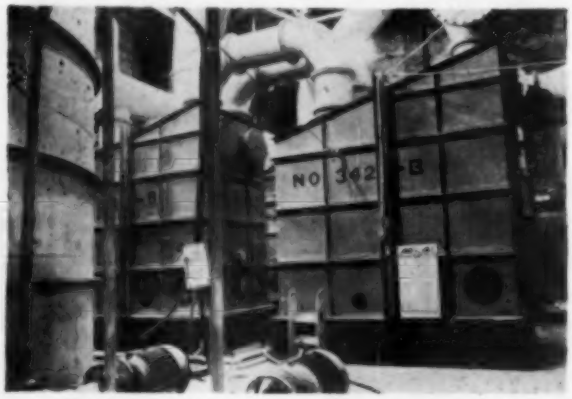
Doyle Scrubbers in Japanese Fertilizer Plant



Doyle Scrubbers for cleaning fertilizer plant exhaust gases are shown at the ammonium phosphate plant of Shin Nippon Chisso Hiryo K.K. near Minimata, Japan. The plant was designed by Dorr-Oliver Inc., Stamford, Conn. The scrubbers remove both flourine gases and ammonium phosphate dust prior to discharging waste gases.

California Weed Conference

More than 500 delegates are expected to attend the ninth annual California Weed Conference in Fresno on Jan. 22, 23, and 24. Conference sessions will be held at the Memorial Auditorium.

Attending the meeting will be farmers, state and federal weed workers, irrigation and reclamation officials, county agricultural commissioners, farm advisors, representatives of chemical companies manufacturing weed control materials, farm equipment distributors, farm editors, agricultural students, agricultural pest control operators, and others.

•

Kraft Bag Appoints Burgers

Ed. Burgers Jr. has been appointed eastern sales manager of Kraft Bag Corp., New York. Mr. Burgers, who had been sales representative in the St. Louis area, will have his headquarters at the company's home office, New York.

Mr. Burgers' duties will include sale and promotion of the company's automatic bag filling machine, the Kraftpacker, as well as the Kraft multiwall bags.

•

Diamond Promotes Pair

Herman E. Meadows and George F. Ham recently were appointed to the technical service staff of the Chlorinated Products Div. of Diamond Alkali Co., Cleveland.

Mr. Meadows takes over his new assignment following four years with the company's southwestern sales staff at Houston, Tex., where he concentrated on agricultural chemicals. He will continue to be located in Houston.

Mr. Ham, with headquarters at Painesville, Ohio, will specialize in herbicidal research and application problems. He was associated previously in a sales capacity with two other chemical producers.

•

Research Post For Leavitt

F. H. Leavitt, who was a pioneer in the direct application of anhydrous ammonia to the soil as a fertilizer, has been appointed to a research post with Shell Development Co., New York. Mr. Leavitt, who joined Shell as an agricultural technologist in 1939, developed the Shell Nitrojection service and the Nitrogation service.

•

Crop Protection Congress

The fourth International Congress of Crop Protection will be held in Hamburg, Germany, this year from the 8th to the 15th of September.

Among the topics to be discussed are: fundamental research on diseases, causal agents, and pests; and the control of diseases and pests. The congress will give a review of the progress of the last five years in plant protection work and the papers delivered by participants will contain only new results not yet published.

The congress will hear studies on the protection of stored products, technique of crop protection, plant quarantine, and legal regulations and organization of crop protection.

PRD, A New Nematocide

A new experimental nematocide, "PRD Experimental Nematocide," has been developed through cooperative research by Boyce Thompson Institute and Diamond Alkali Company for use in agriculture and on ornamentals. Data on the new product was first released and presented publicly at the Fungicide Colloquium held in connection with the annual meeting of the American Phytopathological Society, in Cincinnati, December 6-8.

The new material is available on a sample basis to qualified investigators at agricultural experiment stations for additional evaluation in nematode control applications. Requests should be sent to Diamond's Research Center, Painesville, Ohio.

PRD is chemically identified as 3,4-dichloro tetrahydrothiophene 1,1-dioxide. It has an acute oral LD_{50} of 482 mg/kg; tests show no dermal absorption or dermal irritation from application of one mg of pure PRD per kg of body weight in albino rabbits.

Further experiments show that PRD does not exhibit systemic properties as a nematocide nor does it have the ability to kill root-knot nematodes in living infested roots. It compared favorably with Nemagon and Vapam in greenhouse tests against root-knot nematode. Investigators report PRD possesses outstanding nematocidal activity and that it appears to function as a contact nematocide against free-living forms.

Experimental results covering effective control of nematodes and favorable plant tolerance suggest a rate of application at 40 pounds of active PRD per acre. It is not yet clear with what the best application procedure will be for PRD.

•

Semo Plant Re-Designed

The manufacturing plant of the Semo Liquid Fertilizer Corp., Charleston, Mo., has been completely redesigned and equipped by Ellsworth Equipment & Engineering Co., Indianapolis, Ind. A hydro-cycle system has been installed which provides for a production of fifteen tons per hour of complete liquid fertilizer.

"Pest" Toast you can make to greater insecticide sales... ESPESOL solvents

Obviously the *final* user won't appreciate your using Espesol Solvents in your insecticides, but your *customers* will! And they'll show their preference by reordering again and again.

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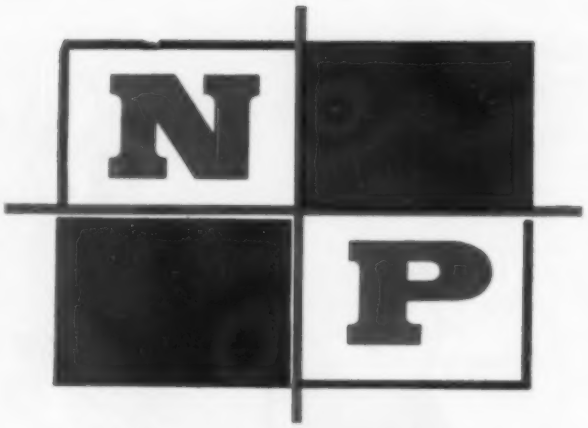
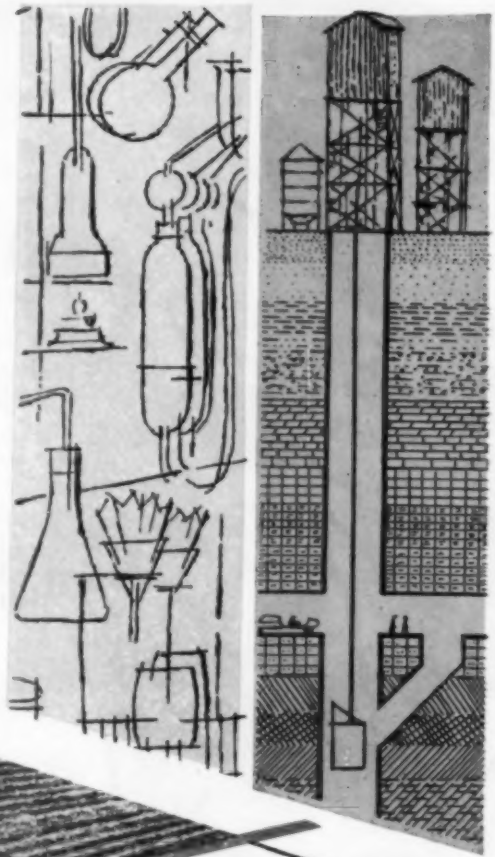
LOOK TO NATIONAL POTASH FOR QUALITY AND SERVICE

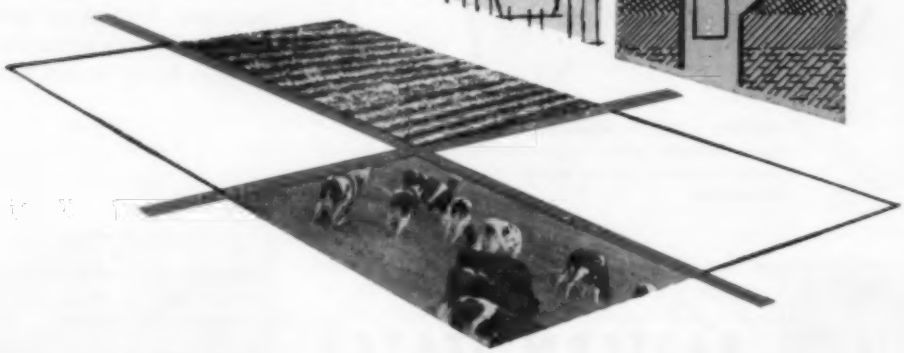


Backed by the skills and experience of its parent companies – Pittsburgh Consolidation Coal Company and Freeport Sulphur Company – NATIONAL POTASH offers important advantages as a dependable source of quality potash.

NATIONAL'S mining operations and refining processes will include the very latest industry techniques, and its storage and shipping facilities have been planned to meet efficiently the demand of the peak fertilizer season.

In addition, NATIONAL POTASH provides a free, comprehensive Technical Service to help manufacturers with granulation, formulation and other production problems. Write for complete information.





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OPFES Elects Meggs

James E. Meggs, sales manager for Oklahoma City's Nichols Fertilizer and Chemical Co., has been elected president of the Oklahoma Plant Food Educational Society.

Mr. Meggs, who served as vice president last year, was elected at the joint annual meeting of the OPFES and the Crops and Soil Conference at Oklahoma A&M College, Stillwater, Nov. 28 and 29. The society is composed of representatives from Oklahoma A & M, the fertilizer industry, fertilizer dealers, bankers, farmers, and other individuals interested in increased soil fertility.

•

Phelps Dodge Directors

The Phelps Dodge Corp., New York, has announced the election of Charles R. Kuzell of Douglas, Ariz., and Howard T. Brinton of New York as directors. The company is the nation's second largest domestic producer of copper and third largest producer of gold and silver. Mr. Kuzell is vice president in charge of operations in the West. Mr. Brinton is president of the Phelps Dodge Copper Products Corp., a fabricating subsidiary.

•

Hough Sales Staff Adds 2

The Frank G. Hough Co., Libertyville, Ill., recently announced the appointments of Robert L. Knox and Herman R. Brown as assistant sales managers.

Mr. Knox will take charge of distributor sales and the contacts with field personnel. Mr. Brown is assuming directing of manufacturers sales, including export and government.

•

Deere Adds To Sales Force

The Grand River Chemical Division of Deere & Co., Tulsa, Okla., has announced the appointments of C. Frank Walter, J. B. Copeland, and Doyle Smith as sales representatives.

All three men are engaged in the sale of the company's urea nitrogen fertilizer (vitrea), nitrogen solutions, anhydrous ammonia and urea feed compound. Mr. Walter is representative in Illinois and Indiana; Mr. Smith, located at Port Lavaca, Tex., represents the company in the Texas Gulf Coast area and the Rio Grande area. Mr. Copeland is sales representative in the states of New Mexico, Arizona, West Texas, and Southern Colorado.

•

Thayer Moves To New Plant

The Thayer Scale and Engineering Corp., Pembroke, Mass., announces that all production has been transferred to their new plant at Pembroke. The twenty acre site houses complete engineering and manufacturing facilities for tripling production capacity.

Test equipment includes a recirculating conveyor system three floors high for continuous testing of Thayer Automatic Scales.

•

Nitrogen Unit Set On Coast

The Ammonia Chemical Co. of California, San Francisco, recently announced plans to begin construction on a $5,000,000 plant in Huron, Calif., as a joint effort with the Monterey Oil Co.

The plant is expected to begin operation within nine to twelve months and will produce anhydrous fertilizer. The site is convenient to the Southern Pacific Co. Railroad and the Main Texas gas transmission pipeline of Pacific Gas and Electric Co.

ASAE Meets In Chicago

"There is a pressing need for the development of better fertilizer placement machinery," Dr. Harry B. Walker, professor emeritus of agricultural engineering, University of California, told members of the American Society of Agricultural Engineers assembled in Chicago's Edgewater Beach Hotel for the society's winter meeting on Dec. 12.

Dr. Walker said fertilizers now are distributed by airplane, irrigation water, and by surface borne equipment, but that in all these methods the hazard of corrosion to equipment exists.

Indicating that sod seeding is practical, L. N. Wise, agronomist, and T. N. Jones, agricultural engineer, explained the results of Mississippi State College's research on drilling seed and fertilizer directly into a dormant summer permanent sod.

Yields of crops drilled into sod have approximately equalled or exceeded those seeded on well prepared seedbeds or broadcast and disked into the sod, they said. Phosphorus placed in contact with or near small grain seed almost doubled the amount of winter grazing up to March 15, as compared with the broadcast application of the fertilizer.

Pacific NW Agricultural Chemical Industry Conference

The annual Pacific Northwest Agricultural Chemical Industry Conference will be held at Portland, Oregon, January 23, and 24th, 1957, at the Benson Hotel. William Ziegler, American Cyanamid Company, Portland, is conference chairman.

Among the speakers at the 2-day meeting are Dr. T. A. Loomis, University of Washington, Seattle, who will discuss "Effects of Anticholinesterase Insecticides on Humans." Oregon's extension entomologist Robert Every will discuss the agricultural chemical sales representative and his help in the field of extension entomology; Mr. Gordon Walker, a farmer from Independence, Oregon, and past-president of the Oregon State Horticultural Society will talk on "A Farmer Looks at the Benefits of Agricultural Chemicals."

The onion maggot has been a "bad actor" in the Northwest, and two investigators, Dr. A. J. Howitt, Western Washington Experiment Station, Puyallup, Wn; and Dr. H. H. Crowell, Oregon Experiment Station, Corvallis, Oregon, will discuss the problem and control measures used.

Two new movies slated for the meeting include "Powdery Mildew," a film by Rohm & Haas, made with the cooperation of Cornell University. "Rival World", Shell Chemical's new 25-minute film on our insect enemies, is another interest-holding feature.

The meetings of the Pacific Northwest Agricultural Chemical Industry Conference are under the sponsorship of the Western Agricultural Chemicals Association.

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Amino Triazole for Ivy in New Jersey Orchards

HUGH fall populations of asparagus beetles and corn borers are causing concern on the part of New Jersey vegetable farmers who fear that these pests will be a major problem in 1957.

Dr. Leland G. Merrill Jr., extension specialist in entomology at the College of Agriculture, Rutgers University, reported that corn stalks in all New Jersey counties were averaging three to four borers each last fall. The asparagus beetles also exhibited increased fall populations in South Jersey.

These findings were among those presented at the annual Rutgers Pesticide Dealers Conference in New Brunswick, N. J., on Nov. 29. Dr. Merrill, chairman of the committee arranging the conference, presented and explained the newest recommendations for controlling pests in 1957. The more than 100 conferees in attendance were given advance copies of the 1957 chemical recommendations for farm and home grounds use prepared by specialists in each field.

Many of the recommendations discussed were departures from the 1956 control advice, and marked the advances made in the development of fungicides, herbicides, and insecticides.

The new recommendations for vegetable disease and pest control were reviewed by Dr. Spencer H. Davis Jr., extension specialist in plant pathology, who reported good results against the red spider mite on beans using parathion, and recommended the use of zineb to combat asparagus rust. Terraclor proved effective in 1956 against the cabbage club root and has also been recommended for use in 1957.

Dr. Merrill advocated the use of rotenone dust for controlling the asparagus beetles in the cutting beds and either calcium, lead arsenate, or DDT dust against the beetle on seedling and brush. For combatting the corn borer, which also attacks potato plants, dusting with five per cent DDT and four per cent malathion has been found effective. Four applications at five-day intervals should start when the first tassel can be seen in the whorl.

The conference also heard a report on the control of biting flies in Salem County. Spraying of cattle during the past two seasons has resulted in an increase in milk production amounting to four dollars per animal, above the cost of the sprays. Sprays were applied weekly for six weeks during the tests.

Pest control suggestions for hay crops included the warning that all counties in New Jersey except Sussex will have sufficient alfalfa weevil populations to warrant sprays for both first and second cutting. In southern and central Jersey, aphids are expected to appear very early in first cutting and prompt applications of heptachlor and malathion or parathion are advised.

A departure from 1956 in the herbicide field was the recommendation of amino triazole as a killer of poison ivy in apple orchards. Donald A. Schallock, weed control specialist at the college, said direct spraying of the apple trees should be avoided.

The suggestions outlined at the conference were tentative and intended as advance information for the dealers. The formal, printed recommendations may differ somewhat later because of varying tolerances for materials in the development stage.

The tentative date of the meeting next year was announced as Nov. 20, 1957.★★

SNC Personnel Changes

The Southern Nitrogen Co., Inc., Savannah, Ga., announced recently the promotion of Robert Heck to director of technical services. Mr. Heck will have full responsibility for assisting fertilizer manufacturers in the use of nitrogen ammoniating solutions.

The company announced also that Robert H. Farrow has joined the organization as director of market research. Mr. Farrow was employed formerly by the Spencer Chemical Co., Kansas City, Mo.

•

AP&CC Splits Eastern Dept.

The American Potash & Chemical Corp., Los Angeles, Calif., recently realigned its Eastern sales department into two operating groups.

Under the new arrangement, the department will operate as a heavy chemicals division and an industrial chemicals division. Ed M. Kolb has been named as general sales manager of the heavy chemicals division, while Dr. Al J. Dirksen will be sales manager of the other new division.

The heavy chemicals division will be responsible for AP&CC's eastern sales activities in borax, potash, and sodium sulfate, as well as the administration of the company's export department and the British subsidiary, Borax & Chemicals, Ltd.

The new industrial chemicals division will handle company eastern sales for lithium, boron, tronacarb, and electrochemicals such as chlorates, perchlorates, and manganese dioxide, as well as all new product marketing.

Natl. 4-H Field Crops Awards

National winners of 4-H Field Crops Awards for 1956 are shown with Hugo Riemer, president of Nitrogen Division, Allied Chemical and Dye Corp., New York. Nitrogen Division is official donor to the field crops program. Mr. Riemer is standing at the center.

Alabama Re-elects Boyd Pres.

Louis H. Wilson, Secretary and Director of Information for the Institute, told members of the Alabama Soil Fertility Society at Montgomery, Ala., December 7, that "in a very real sense, the efficient use of fertilizer helps pave the road for better public relations for the American farmer "Through the efficient use of fertilizer," he said, "farmers cut their cost of production and the benefits are shared by all of us."

Other speakers at the meetings, which began on December 6, featured leaders and authorities in the field of agriculture. Officers and directors of the society elected at the meeting on December 7 are: president, Frank E. Boyd, Virginia-Carolina Chemical Corp., Montgomery (reelected); secretary-treasurer, Charles Summerour, American Potash Institute, Montgomery (reelected); vice presidents, Warren Belser, United States Steel Corp., Birmingham; and Earl Cooper, Roanoke Guano Co., Roanoke.

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Purdue Pest Control Conf.

The Purdue University Pest Control Operators Conference will be held at the university in Lafayette, Ind., from Jan. 28 to Feb. 1, 1957. The conference is open to those in the pest control business and those who are interested in pest control problems.

Companies interested in displaying products or equipment at the conference have been urged to contact the department of entomology at the university in advance for display space.

•

Seeks Civil Service Change

J. R. Douglass of Twin Falls, Idaho, has called upon entomologists to assist in a move towards revising the present Civil Service classification system.

Mr. Douglass is interested in separating professional and scientific civil service employees from the General Schedule (GS) employees to allow separate consideration, "economic and otherwise, in order to maintain a high level of professional and scientific services for the Federal Government." The National Society of Professional Engineers is working with a Congressional Committee on this question, according to Mr. Douglass, who urges entomologists to join in the project to get the Professional, or "P," grade reestablished.

•

Fairfield Moves Sales Office

The Fairfield Chemical Division, Food Machinery and Chemical Corp., has relocated its sales headquarters from Baltimore to New York. The new location is at 441 Lexington Ave., Room 408, New York 17.

Judkins Joins Velsicol

William R. Judkins recently joined the agricultural chemicals sales staff of the Velsicol Chemical Corp., Chicago, and will assist the company's area manager, Larry Bewick, in Mississippi, Louisiana, Arkansas, and Tennessee.

Mr. Judkins will maintain headquarters at Little Rock, Ark. Velsicol produces technical chlordane, heptachlor, and endrin at manufacturing plants in Memphis, Tenn., and Marshall, Ill.

Howell Sues V-C

Joseph A. Howell, former president of Virginia-Carolina Chemical Corp., Richmond, Va., filed a suit for $435,000 against the firm recently, claiming that the company had repudiated his 10-year contract.

Mr. Howell was ousted as president in July following a bitter proxy fight. In his suit he contended that his contract assured him a minimum annual salary of $60,000.

When Mr. Howell's forces lost out in a proxy fight to a group headed by former Governor John S. Battle and the late Rupert T. Zickl, Mr. Howell was automatically out as president. The reason was a V-C rule that the president must be a director and he had lost his directorship. F. Elmore Butler, general counsel for V-C said the firm would find an answer to Mr. Howell's suit "in due time." He and other V-C officials declined further comment.

•

Spray Operators' School

The ninth Custom Spray Operators' Training School, sponsored by the University of Illinois College of Agriculture, Extension Service, and Illinois Natural History Survey, will be held at the university on Jan. 23, 24, and 25.

The tentative program calls for a meeting of the Agricultural Spraying Association on the afternoon of the 23d, with the actual school starting on Jan. 24. The first item for discussion at the school will be the "European Corn Borer in Illinois." J. D. Briggs, W. H. Luckman, and H. B. Petty will speak on the situation, research results in control, timing of insecticide applications, which fields to treat?, and diseases of the corn borer and their importance.

G. C. Decker will talk on the Chemical Residues in Crops and E.C. Spurrier will deliver a lecture entitled "Weed Control in Corn."

Other subjects to be discussed include; control of spotted alfalfa aphid, Canada Thistle control with amino triazole, the insect situation in Illinois, general insect problems, equipment for mixing and applying liquid fertilizers, and the uses of soil sterilants in Illinois.

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'57 Recommendations on Midwest Agronomy Progress

CORRECT fertilizer placement in profitable crop production will receive special attention at the forthcoming annual joint meeting of Midwestern agronomists and fertilizer industry men at the Edgewater Beach Hotel, Chicago, February 14 and 15. The program will also headline reports on new fertilizer research.

An attendance of more than 600 is expected at the two-day meeting sponsored by the Middle West Soil Improvement Committee. Dr. Kermit C. Berger, University of Winconsin, will be chairman. Visiting agronomists and industry men will be welcomed by Richard E. Bennett, president of the Middle West Soil Improvement Committee, and Zenas H. Beers, its executive secretary.

Of particular interest will be a presentation on "Fertilizer in Profitable Farming," by Walter Mumm, of the Crow Hybrid Corn Co., Milford, Illinois. Mr. Mumm will illustrate his address with color slides showing profitable crop response from the use of fertilizer. Another interesting feature will be a discussion and a question and answer session on "Proper Placement of Fertilizer in the Row for Corn."

Dr. A. J. Ohlrogge, Purdue University, will lead off with a talk on "What Are the Fertilizer Needs of Corn?" W. H. Garman, director of economic relations, National Plant Food Institute, will discuss "Experiment Station Recommendations on Fertilizer Placement."

W. C. Hulburt, agricultural engineer, Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Maryland, will report on the farm mechanization factors in proper placement of fertilizer. He will review the equipment now available from implement manufacturers for placement of fertilizer in the row.

Recommendations by agronomists for fertilizer grades and ratios for 1957 in the various Midwestern states, will be presented by Dr. Kermit C. Berger. Agronomists from 13 Midwestern states will attend two-day sessions of the North Central Soils Research Committee at the Edgewater Beach Hotel on Tuesday and Wednesday, February 12 and 13, preceding the joint meeting.

•

N.C. State Pesticide Class

The ninth annual Pesticide School conducted by the school of agriculture at North Carolina State College, Raleigh, is being held Jan. 10 and 11 at the College Union building.

Founded to give latest research data and recommendations in the field of pesticides and equipment, the school deals with herbicides, fungicides, insecticides, and rodenticides.

George M. McNew will open the planned program with a report on the search for the perfect fungicide. F. A. Todd, reviewing the "Results with New Nematocides for Tobacco," will also be among the first day's speakers.

Results of research on pests of cotton, apples, forage crops, vegetables, and soils will be explained during the second day of the school. Major changes in control recommendations will be outlined by George D. Jones.

•

S.C. Pest Control Assn.

The structural pest control operators of South Carolina elected to organize a state association at a meeting at the Clemson House, Clemson, S.C., on Nov. 27 and 28.

Fred P. Wright of the Wright Pest Control Co., Aiken, was appointed temporary chairman and E. D. Robbins of Modern Experimenting Co., Rock Hill, temporary secretary.

A temporary committee was designated to draw up a constitution and by-laws for the new organization and a second meeting has been tentatively scheduled for Feb. 8 and 9 at Columbia.

Highlighting the November meeting was a discussion of proposed legislation affecting the structural pest control industry. Speakers included R. A. Moncrief of the Structural Pest Control Commission of Georgia; Dr. Ralph Heal, executive secretary of the National Pest Control Association, Inc.; Senator W. A. Lawton of Estill; Dr. J. K. Reed, associate entomologist, South Carolina Crop Pest Commission; and J. H. Cochran, state entomologist.

•

GPFES Meeting This Month

The annual meeting of the Georgia Plant Food Educational Society has been scheduled for Jan. 15 and 16 at the University of Georgia in Athens. The meetings and banquet are to be held in the new Georgia Center for Continuing Education on the campus.

•

Mexican Co. Hits Milestone

The Pan American Sulphur Co.'s Jaltipan Dome in Vera Cruz, Mexico, produced its 1,000,000th ton of sulphur on Dec. 10. In 1956, the company's first complete year of production and shipping, Pan American produced more than 600,000 tons of sulphur. Current production is at the rate of 2,000 tons per day.

In anticipation of greater shipments this year, Pan American plans to start construction of additional loading and docking facilities to augment the company's present deep-water installation at Puerto Mexico.

•

Airlift for Pyrethrum

To avoid the blocked Suez Canal, African Pyrethrum (PYR) is being shipped into the U. S. by air. Picture shows arrival at New York's International Airport of first trans-Atlantic flight of PYR extract. The shipment consisted of 1000 pounds flown from the Chimiphar plant at Bukavu, on the eastern edge of the Belgian Congo in the heart of Africa.

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Fertilizer Plants To Aid Mexican Expansion

NEW and projected fertilizer plants are creating the nuclei for the creation of new industrial zones in Mexico. The plants, with by-product and related industries, will furnish the chief manufacturing activities in several Mexican areas heretofore devoted almost exclusively to agricultural pursuits.

Typical of these projects, and the latest announced, is a project for the Laguna area in northwestern Mexico, which will include parts of Coahuila, Durage and Chihuahua. Activity in the entire area, comprising portions of these three states, is expected to be considerably stimulated by the Fertilizantes Monclova nitrogenous fertilizer plant scheduled for Monclova, in the state of Coahuila. It is hoped the plant will contribute to industrializing cotton, timber and mineral products in the area. The new company is reported to have an initial capital of $5 million, financed by the Nacional Financiera, the Banque Nationale Pour le Commerce et L'Industrie, and Cie. Saint Gobain. The manufacturing unit will have a daily capacity of 100 tons of anhydrous ammonia.

Plans are being drawn for an industrial city to be built around another huge plant near Irapuato, this one with a capital of $3.6 million financed by the Sociedad Mexicana de Credito Industrial. Cooperating in this project are technicians of the Nacional Financera, the Federal Electricity Commission, and the Banco Nacional de Mexico.

Plans are also underway for similar developments at Guaymas (Sonora), Coatzacoalcos (Vera Cruz), and one at Tampico which will utilize petroleum by-products.

Among American agricultural chemicals producers in Mexico, is Allied Chemical International Co., a subsidiary of Allied Chemical & Dye Corp. It is reported that Allied Chemical is planning extensive investments in the country.

Largest of the new Mexican "giants" will be the Guanos y Fertilizantes de Mexico plant at Coatzacoalcos, which represents an investment of $16 million, half of which will be spent in the U. S. and abroad for equipment. Production at this plant is scheduled to be 49,500 tons of ammonia, 72,600 tons of nitric acid, and 91,470 tons of ammonium sulfate.

•

Israel Plans Railway Link

Israel has announced plans to construct a railroad line to link the southern port of Elath with the national rail net. The southernmost point now reached by the existent railway system is Beersheba. The planned extension would run 185 miles through Dimona, a new Negev town, the phosphate mines at Oron and the Araba depression to Elath on the Gulf of Aqaba. There will also be a branch from Oron to the Dead Sea works at Sodom.

Shipments over the new link will include 580,000 tons of minerals a year, including 100,000 tons of phosphates, 100,000 tons of salt, and 80,000 tons of potash.

•

Hay Gets Little Fertilizer

U. S. Department of Agriculture studies reveal farmers generally are willing to spend money and time fertilizing such crops as vegetables, but virtually neglect hay, pasture, and cover crops.

A recent survey showed that on the average, farmers use 68 pounds of nitrogen per acre for green and yellow vegetables and 83 pounds for potatoes.

They averaged just one pound of nitrogen per acre of hay, however, and four-tenths of a pound for pasture and cover crops. The same pattern was true, with slight variations for phosphate and potash fertilizers.

•

Cattle Grub Control Sought

The Livestock Conservation, Inc., Chicago, a non-profit educational and research organization, has started an educational program to encourage the control of the cattle grub.

Using letters and posters, the organization hopes to encourage cattlemen to organize for the production of grub-free feeders and other cattle by treating with proved rotenone sprays or dust. The livestock group cites a recent estimate by USDA scientists which charges the cattle grub with causing over $7 loss per infested animal.

•

Witco Acquires Ultra

Witco Chemical Co., New York, has acquired all of the outstanding stock of Ultra Chemical Works, Inc., Paterson, N. J. Ultra will now operate as a wholly owned division of Witco with no change in personnel.

A large producer of synthetic organic chemicals, Ultra's main plant is in Paterson, and additional manufacturing facilities are maintained in Joliet and Chicago, Ill., and Hawthorne, Calif.

•

Harry F. Sinclair Dies

Harry F. Sinclair, founder of the Sinclair Oil Corp. died at his home in Pasadena, Calif., recently. He was 80 years old.

Mr. Sinclair, who was also chairman of the board of the Richfield Oil Corp., retired from active management in 1949 at the age of 72 and five years later as a member of the board of Sinclair. By that time the assets of the concern he founded in 1916 had grown from $51,000,000 to around $1,200,000,000. Its earnings topped $68,000,000.

•

New Dutch Fertilizer Plant

Centraal Stickstof Verkoopkantoor, the joint sales office of the three leading Netherlands producers of nitrogenous fertilizers, recently inaugurated at Rotterdam a new modern plant for the storage and shipment of fertilizers.

The storage shed has a capacity of 40,000 metric tons of bulk fertilizers and the boat-loading facilities can handle 300 tons per hour. This expansion of the Rotterdam port facilities was necessitated by the increasing production and export of nitrogenous fertilizers. In 1955, exports included 322,000 tons of ammonium sulfate and 158,000 tons of calcium ammonium nitrate, much of which was destined for the United States.

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A. Unless there are abnormal conditions, *we would recommend a steam tube dryer,* especially if the material is heat sensitive.

Q. What advantages does the steam tube dryer offer *in comparison with indirect fire types?*

A. There are many advantages. One is ease of operation and low maintenance costs due to the definite moderate temperature (established by steam pressure) imposed on both the material being dried and on the dryer itself. Another advantage is that there is no furnace refractory maintenance. Still another advantage is quick "warm up" and "cool off". In many cases where the drying operation is intermittent, there is no need to shut off the steam supply or stop rotation when the wet material feed is interrupted since steam is condensed in quantity only when wet material is fed.

Q. *Isn't steam supposed to be an expensive drying medium?*

A. That depends on how the steam is used. It is true that a low overall efficiency results (often as low as 25%) when steam is used to heat air for low temperature drying. However, the Louisville Steam Tube Dryer normally utilizes 85% or more of the available heat in the steam. By combining this with a reasonable minimum efficiency of 80% in modern small steam generators (and higher in large boiler plants), you get an overall efficiency close to 70%. This compares with indirect fire dryers which develop an efficiency seldom higher than 50% and generally less.

Q. *Does material insulate the tubes by sticking to them or by clogging the spaces between tubes?*

A. Very few materials have this tendency to any serious extent and most of these, when properly conditioned before feeding, handle without difficulty. For the balance, no dryer using heated surfaces for heating the material is a proper application.

Q. *How can I be sure a Steam Tube Dryer will handle and dry my material satisfactorily?*

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Nitrogen Pile-Up Continues

Further piling up of world stocks of nitrogen, in various forms, is indicated for the 12 months ending June 30, 1957, unless production is radically curtailed, particularly in the U. S. warns Aikman (London), Ltd., in its annual report on the world nitrogen industry.

The firm estimates 1956-57 total world capacity (excluding Russia) at 9,160,000 metric tons and consumption at 7,990,000 metric tons.

"It must be remembered, however," Aikman notes, "that the world situation today is so chaotic that a considerable decrease in European production, under our estimate, might well take place owing to fuel difficulties, and in consumption owing to the shortage of shipping, as a substantial portion of the European production has to be exported."

"Under any circumstances," the report continues, "it is clear that stocks at June 30, 1957, will be much higher that at June 30, 1956, unless production is radically reduced in the U. S. as compared with present estimates.

"If present building plans are carried out, the capacity available for 1957-58 will reach about 10¼ million tons so, in order to avoid unwieldy stocks at June 30, 1958, production will have to be cut down substantially during the next two years."

The report notes, however, that "prospects for a steady increase in consumption are good, considering the annual increase in world population, and it is felt that, with a normal increase in consumption, supply and demand might be balanced by 1961-62."

Russian production for 1956-57 is estimated at 870,000 tons for agriculture and 130,000 tons for industry, with all production expected to be consumed in the U.S.S.R. and its satellites.

U. S. consumption of nitrogen for agriculture, the brokerage house says, was some 150,000 metric tons more than it estimated in its half-yearly report. The final figures for 1955-56 showed an overall increase in consumption of about four per cent.

U. S. production has been cut back sharply, Aikman asserts, because many of the inland plants have been unable to sell their full capacity locally and distance from the coasts makes the export market impossible.

•

Vulcan Promotes Two

The Vulcan Steel Container Co., Birmingham, Ala., has announced two appointments in the company's sales department.

Floyd A. White, Jr., was named sales manager of the Southeastern Region and will have charge of the sale of pails and drums and supervise district sales offices and warehouses in Tennessee, Georgia, North and South Carolina, Virginia and Florida.

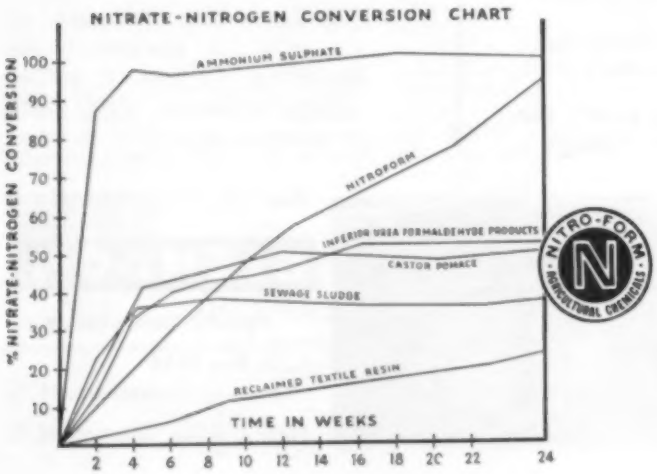
Charles B. Little has been named sales manager of the Southwestern Region covering Louisiana, south Mississippi, Texas, Arkansas, and Oklahoma.

Both men will headquarter at the company's main office and factory in Birmingham.

More and More Specialty Fertilizer Manufacturers are using NITROFORM®

Nitroform has so many distinctive advantages it's no wonder more and more fertilizer manufacturers are using this solid Urea-Form in their mixes.

Don't be misled by other forms of urea-formaldehyde. Make sure that the Urea-Form you are using in specialty fertilizers passes the accepted A. I. test for nitrogen availability. Results count. The chart below illustrates the release of available nitrogen of Urea-Form in comparison with less desirable substitutes.



Why NITROFORM?

- it mixes easily . . . is now available in a colored granular or powder form.
- is clean, odorless, non-leaching and non-burning.
- is economical, and offers larger profits in mixed fertilizer sales.
- is field test proven . . . to meet specific nitrogen requirements of Urea-Form.

Write now and let us give you complete facts and figures on how NITROFORM can increase your sales and profits.

NITROFORM
AGRICULTURAL CHEMICALS, INC.
A DIVISION OF
Woonsocket Color & Chemical Co.
92 Sunnyside Ave. • Woonsocket, Rhode Island

Equipment AND BULLETINS

H & D Box Plays Dual Role

A new-style shipping carton designed and produced by Hinde & Dauch, Kansas City, Kans., holds four one-gallon cans and converts quickly and easily to a colorful display unit with fold-up panels. The new box is reported to have greatly increased the sale of cattle insecticides for Farnam Co., Phoenix, Ariz., producer of livestock spray concentrates. The carton has a shipping weight of approximately 34 pounds.

•

Bulletin Describes Feeders

The accurate feeding of two or more liquids and/or solids into continuous processes by gravimetric or volumetric means can be accomplished by the proportioning equipment described in a four page bulletin 10-N1 recently issued by Omega Machine Co., Providence, R. I.

•

New Insecticide Formula

The Jasgo Chemical Co., Brooklyn, N. Y., last month announced a new formula for its "Wiff Wonder Bomb" aerosol insecticide. It contains pyrethrins, piperonyl butoxide, and bicycloheptene dicarboximide for the control of flies, mosquitoes, bedbugs, roaches, carpet beetles, ants, fleas, lice, and a number of other household insects. According to Jasgo, it is non-inflammable, non-irritating, and incorporates a number of other safety features. The formula may be used as a space spray (at a rate of four seconds per 1000 cubic feet), or for direct application (ten seconds per 100 square feet of floor space).

•

Young Introduces New Valve

The Young Machinery Co., Muncy, Pa., recently introduced a new line of precision rotary feeder valves in sizes ranging from two to 16 inches. Volumetric capacities range from 0.0044 cubic foot per revolution for a two-inch feeder to 3.900 cubic foot per revolution for the 16-inch size. The standard feeders are equipped with outboard anti-friction bearings and packing glands, with inlet and outlet flanges 150 lb. standard drilling unless otherwise specified.

The Young valve is normally used as (1) a flush control unit, (2) a volumetric feeder for discharging storage bins, silos and bulk shipping containers, (3) a valve and explosion check, (4) a volumetric feeder for controlling the rate of feed to mixers, blenders, grinders, weigh-hoppers, and (5) an air lock feeder at the inlet and discharge points of a pneumatic conveying system. The valves are furnished in steel, monel, inconel, and nickel casings.

Some of the 2" valves of Young Machinery Co. Rotors are the eight-vane type and can be furnished with flexible tips of nylon, or neoprene rubber when handling coarse granular or lumpy materials.

Forest Fertilization Book

The practice of fertilizing forests is considerably more advanced in West Germany than in the United States, according to a newly translated report on German forest fertilization results. The 112-page report tells of nursery yields increased from 100 to 400 per cent and yields of forest trees up 150 to 250 per cent in Germany.

Copies available from Dr. E. D. Crittenden, Allied Chemical & Dye Corp., 40 Rector St., N. Y. 6, N. Y.

•

NACA Offers Safety Kit

The National Agricultural Chemicals Association, Washington, D.C., has issued a special kit on pesticide safety for use in preparing company safety programs.

The kit contains materials to aid in telling the safety story to the public. It includes a few pieces, such as the "Safety Code," which can be ordered in quantity for distribution, and also includes material which advertising, public relations, and sales departments can adapt to fit into the company safety and sales programs.

Orders for the kit or any materials desired should be sent to the Association or to the National Safety Council, which is cooperating in the safety program.

•

Shell Nematode Chart

A new nematode chart, 16 x 20 inches is offered by Shell Chemical Corp., New York. It is a revised version of a chart issued last March, and will shortly be reproduced in an 8½ x 11 size.

For Dependable Insecticides and Herbicides

think first of **DIAMOND**

Technicals and Formulations

Insecticides

DIAMOND dependable insecticides have long been favored because of their uniform high quality. DDT, BHC and Lindane Technicals are supplied in many types and forms.

Insecticides for Formulators and Producers

DDT—100% Technical
DDT—Wettable Powders
DDT—Dust Concentrates and Emulsions
Lindane—Emulsions, Wettable Powders, Dusts
Lindane—100% Gamma Isomer of BHC
BHC—40% Technical
BHC—12% Wettable Powders and Dusts
BHC—Emulsion Concentrates
K-101—Miticide

Weed Killers and Brush Control Chemicals

DIAMOND weed and brush killers, based on the 2,4-D and 2,4-T chemical groups, meet every weed and brush control problem.

These dependable DIAMOND herbicides are produced in two forms: *Technical* for use by formulators and processors in their own formulations and *ready-to-use formulations* for farmers, ranchers, country clubs and homeowners.

Technicals for Formulators

WEED KILLERS

2,4-D Acid • Technical Butyl-D
Technical Isopropyl-D
Technical 2-Ethyl Hexyl (Iso-Octyl)-D (Low Volatile)
Technical BEP-D (Low Volatile)

BRUSH CONTROL

Technical Butyl-T • Technical Isopropyl-T
Technical BEP-T (Low Volatile)
Technical 2-Ethyl Hexyl (Iso-Octyl)-T (Low Volatile)

Ready-To-Use Formulations

WEED KILLERS

*4# Mixed Amine-D • 4# Dimethylamine-D
2.67# Butyl-D • 4# Butyl-D • 6# Butyl-D
4# 2-Ethyl Hexyl (Iso-Octyl)-D (Low Volatile)
4# BEP-D (Low Volatile) • 3.34# Isopropyl-D

BRUSH CONTROL

*4# Butyl-T • 4# BEP-T (Low Volatile)
4# 2-Ethyl Hexyl (Iso-Octyl)-T (Low Volatile)
2,4-D—2,4,5-T Mixtures • 2#—2# Butyl Brush Killer
2#—2# 2-Ethyl Hexyl Brush Killer (Low Volatile)
2#—2# BEP Brush Killer (Low Volatile)

*Numbers are pounds of 2,4,5-T or 2,4-D acid equivalent per gallon.

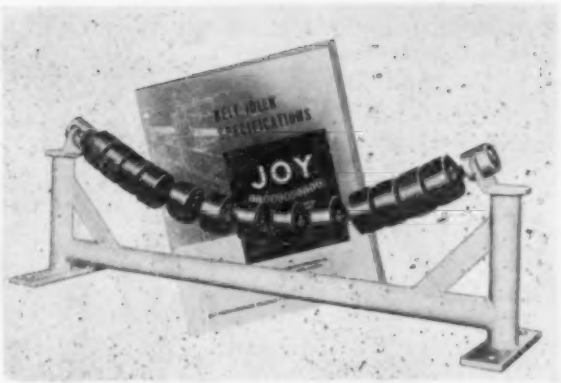
DIAMOND research is constantly seeking new and better insecticides and herbicides and working with formulators and agricultural chemists in the development of more efficient forms and application methods. We will be glad to work with you. For information on DIAMOND Chemicals and technical co-operation write, DIAMOND ALKALI COMPANY, 300 Union Commerce Building, Cleveland 14, Ohio.

DIAMOND ALKALI CHEMICALS

Diamond Chemicals

Belt Idler

Joy Manufacturing Co., Pittsburgh, Pa., is offering a new 12-page "Limberoller" belt idler booklet, 2-3A, which contains design and application data for the company's bulk materials belt conveyors. Included are descriptions, dimensional drawings, specification tables, and suggested applications for "Limberoller" Idlers and various troughing, impact, training and return brackets.



•

New Carrier Bag Flattener

A new vibrating bag flattener, designed to flatten bottom-heavy bags of loose, bulk material, has been put on the market by Carrier Conveyor Corp., Louisville.

The flatteners work on the natural-frequency principle, gently tossing the bags upward and forward with each movement of the trough. Flattening is reportedly achieved almost immediately because the material inside the bag conveys more quickly than the bag itself. Materials now being handled by the Carrier vibrating bag flattener include pelletized fertilizer, carbon black pellets, plastic powders, and polyethylene and neoprene cubes.

•

New Clark Fork-Lift

The Clark Equipment Co., Battle Creek, Mich., recently introduced a new addition to its line of battery powered fork-lift trucks, the EUT-8024, with an 8000-pound capacity and dual drive wheels. The new model has a turning radius of 85 inches, aisle for right angle stacking of 148½ inches, and overall length of 133 inches. With four speeds forward and four reverse, it will travel loaded at 5½ m.p.h.

Power for the unit comes from a dual field, high-torque motor. A switch operated by the brake pedal cuts off power to drive the motor when the hydraulic brakes are applied.

•

Nalco Corrosion Inhibitor

The National Aluminate Corp., Chicago, has announced the development of a new corrosion inhibitor for tanks and equipment handling liquid fertilizers.

"Nalco 889" is reported to cut corrosion rates 94 per cent or more by forming a corrosion-resistant protective film on metal surfaces. The inhibitor can be fed through chemical proportioners by preparing a solution of Nalco 889 with water or with the liquid fertilizer itself.

•

Diamond Issues Booklet

The Diamond Alkali Co., Cleveland, has issued a booklet depicting Diamond's operations at its Painesville (Ohio) Works. Prepared primarily for visitors, the booklet also is intended to provide a convenient opportunity for an "armchair tour" of the plant.

The Painesville Works is one of 15 plants operated by Diamond. Other chlorine-alkali plants are located in Maryland, Arkansas, Alabama, and Texas.

•

CIC Introduces Chem-Vape

Chemical Insecticide Corporation, Brooklyn, has introduced Chem-Vape, a new one shot treatment for the control of weeds and soil borne insects and diseases. One application of Chem-Vape, a dithiocarbamate liquid, properly applied prior to planting is said to insure effective control of the various grasses and broad leaf weeds. This same application will also destroy nematodes, insects, and fungi which are found in the soil.

Technical booklets describing Chem-Vape in detail are available upon request.

New Panogen Seed Treatment

Panogen, Inc., of Ringwood, Ill., has announced the availability of two new seed protectants for slurry application. They are trade named Panoram D-31 and Panoram 75 and are said to possess excellent suspension qualities.

Panoram D-31 is a combination insecticide-fungicide and is recommended as a seed treatment for corn, soybeans, sorghum, beans, and peas. Active ingredients are thiram and dieldrin.

Panoram 75 is a seed disinfectant for treating corn, rice, sorghums, soybeans, grasses, legumes, and vegetables. The active ingredient is thiram.

•

New Monsanto Weed Killer

Monsanto Chemical Co., St. Louis, reports that its new weed killer, Vegadex, which kills annual weedy grasses and certain broad-leaved weeds as they sprout, will be available to growers this year. Identified by the initials CDEC (for 2-chloroallyl diethyldithiocarbamate), the new weed killer is said to offer a high safety factor to crops.

•

New A&S Bags In Production

Arkell & Smiths have announced that new machinery for manufacturing their stepped-end bag — called the "Step-Flex" — is now in operation at their Wellsburg, W. Va., plant on the Ohio River. The new bag is now offered with either three or four walls. Additional plant expansion is expected to bring the annual production of Step-Flex bags up to 72 million.

•

Swenson Offers Booklet

A new, eight-page, illustrated booklet titled, "Phosphoric Acid Evaporators" is being offered by the Swenson Evaporator Co., a division of Whiting Corp., Harvey, Ill. The booklet relates the operation, general design, and details of construction of the Swenson Phosphoric Acid Evaporators. Information is also given on phosphoric acid slurry coolers.

Copies of the booklet, Bulletin SW-202, may be obtained from the company.

In full color . . . for counter, shelf, wall.

How Cyanamid helps sell your **MALATHION** formulations

And helps YOU sell them too! . . . The advertisement in this point of sale display will make over 135 *million* advertising impressions in 1957.

The display can focus all this advertising power on *your product* right where sales are made: on the counter, wall or shelf of dealers selling your malathion formulations to home gardeners. And it does more. It carries your malathion package. Its full color illustrations diagnose bug problems by themselves. It hands out free consumer folders. Streamers, folders, envelope stuffers go with it, ALL FREE for the asking.

Heavy trade advertising has alerted your distributors and dealers, offered these *working* sales tools. So has direct mail. It's the biggest, most helpful insecticide advertising and merchandising campaign in garden trade history.

Get details on how to put complete malathion sales kits (to sell *your* product) in the hands of your distributors. Write or call American Cyanamid Company, Agricultural Chemicals Division, Dept. AC, 30 Rockefeller Plaza, New York 20, N. Y.

CYANAMID

PRODUCERS OF: Aero® *Cyanamid: Fertilizers–Defoliants–Herbicides* Aeroprills® *Ammonium Nitrate Fertilizer*
Aero® *Ammonium Sulphate* Amanol® *Nitrogen Solutions* Amino Triazole *Herbicide and Defoliant* Anhydrous Ammonia
Phosphates *for Acidulation and Direct Application* Thiophos® *Parathion Technical* Malathion *Technical* HCN *Fumigants*
Cyanogas® *Calcium Cyanide Fumigants* Potassium Cyanate *Weedkiller for Agriculture and Turf* *Trade-mark

News Brevities

DELTA LIQUID PLANT FOOD, has been granted charter of incorporation to deal in fertilizer and farm equipment, listing capital stock of $50,000.

AC

45 ACRES IN JACKSON, TENN., has been acquired by The Tennessee Farm Co-Operative as a site for a large fertilizer and feed plant.

AC

THE WESTERN AGRICULTURAL CHEMICALS ASSOCIATION will hold their Spring Meeting in the Hotel Biltmore, Los Angeles, on April 2. Details of the program will be announced at a later date.

AC

JAMES N. HINYARD has been appointed director of market development for American Potash & Chemical Corp., Los Angeles. He succeeds Dr. A. J. Dirksen who recently was named general sales manager of the company's industrial chemicals division.

AC

DURHAM CHEMICAL CO., Los Angeles, has announced the sale of its majority interest in Quimica Agricola del Pacifico SA se CV, Mexicali. The company announced also that its sales force has been expanded in the Imperial Valley of California, and a similar expansion is planned for the Coachella Valley and Kern County.

AC

THE WESTERN COTTON PRODUCTION CONFERENCE has been announced for March 4-5 at the Hotel Westward Ho in Phoenix, Ariz.

AC

THE CALIFORNIA MOSQUITO CONTROL ASSOCIATION, INC., Turlock, Calif., has announced that the association's 25 annual conference will be held January 21, 22, and 23, 1957, at the Hotel De Anza in San Jose.

AC

W. R. GRACE & CO. is the subject of a 103-page study prepared in book form by the investment banking firm of Smith, Barney & Co. The analysis states that the unique organization has placed increasing emphasis on chemicals and industrial operations. The company now has five principal areas of development: chemicals, paper, oil, transportation, and the production and sale of consumer goods in South America.

AC

INTERNATIONAL MINERALS & CHEMICAL CORP., Chicago, has moved its New York offices to larger quarters in the new building at 485 Lexington Ave. The company, which produces minerals and chemicals for industry and agriculture, has leased the 27th floor.

UNITED STATES BORAX & CHEMICAL CORP., New York, has leased the eighth and part of the ninth floors of 50 Rockefeller Plaza, New York. The offices will be the headquarters for the Pacific Coast Borax Co. and United States Potash Co.

AC

JOHN M. WALLACE has been appointed manager of the Eastern Sales Division of Werthan Bag Corp., Nashville, Tenn., with offices at 1430 Broadway, New York.

Dry dust insecticides cost less to produce– cover more uniformly

when formulated with

CELITE

diatomite fillers

WHEN applying dry dust insecticides, it's the volume that counts. Yet when you buy inerts, you pay by the pound. That's why Celite saves you money because it gives you as much as 10 times more volume than equal weights of other mineral fillers.

Another important Celite benefit is the neutralizing of dense let-down agents. These usually pack down and form pockets of inactive ingredients. But when a small percentage of Celite is present its high bulking action keeps the final dust fluffed up, assuring uniform poison dispersion on any foliage.

Ask your Celite engineer to demonstrate these advantages in your plant. Call him at your nearest J-M sales office or write Johns-Manville, Box 14, N.Y. 16, N.Y. In Canada, Port Credit, Ontario.

*Celite is Johns-Manville's registered trade mark for its diatomaceous silica products

Johns-Manville CELITE

INDUSTRY'S MOST VERSATILE MINERAL FILLER

PO_3 INSECTICIDES

(*From Page 35*)

wise been a fatal outcome will be averted. For this purpose, however, much greater dosages of atropine are required than the physician is accustomed to employ in other areas of medical practice. It cannot be emphasized too strongly that the prompt administration of atropine, initially by the intravenous route, in dosages pushed to the limit of tolerance is the keystone of the emergency treatment of severe cases of poisoning.

Careful clinical observation of the recovery of cases of near-lethal exposure to the phosphates employed as insecticides has not revealed any residual or irreversible effects of such poisoning. Furthermore, phosphate insecticide poisoning is not cumulative in the sense that there is accumulation of toxicant in the body as is the case with DDT and heavy metals. There can, however, be a cumulation of *effect* with repeated exposure. If each successive exposure inactivates a slightly greater amount of cholinesterase than can be replenished prior to the next exposure, then a steady decline in the level of enzyme activity will take place. This decline may not be accompanied by symptoms until a critical level is reached, at which the onset of illness may be abrupt. For this reason it is sound practice in the case of personnel continually engaged in work with phosphate insecticides to make periodic checks of the level of red blood cell cholinesterase activity. Signs and symptoms of poisoning usually do not appear before red blood ChE activity has declined to a level in the range of 25-50% of normal, although decreases to 75% of normal or below should be cause for removing an individual from exposure. It is important to remember that the capacity for ChE inhibition is a property of all members of this class of compounds, and persons affected by one should avoid contact with functionally similar materials.

A variety of methods are available for the determination of ChE activity. Most of these are based on the measurement of acid production when a known quantity of blood or tissue is incubated in a system containing an excess of ACh. One convenient technique is that published by Michel which employs a glass electrode to measure the fall in pH in a suitable buffer system. This has gained wide acceptance since it has the virtue of simplicity and brevity coupled with a satisfactory degree of accuracy. More recently a rapid screening procedure has been devised which depends upon the change in color of a bromthymol blue (BTB) indicator solution during armpit incubation with a mixture of blood sample and ACh. The BTB method is not capable of yielding highly quantitative results, and many results obtained thereby may have to be checked by reference to more precise methods. However, it is finding a definite application in the field, and should prove to be a valuable guide in control measures.

Now what is the significance of all of this to the problem of safety with phosphate insecticides in the field? Just this — it means that we have and have had all of the information at our disposal that is necessary for the control of the hazard, so that accidents can only be the result of indifference or carelessness. As Hazleton (2) has said — "rarely in our history has so much been known about a class of chemicals and its individual members before they were put to constructive use." This is not to say that no questions remain unanswered about the potential hazards of phosphate insecticides, but I do maintain that we have a greater fund of basic information about them than we have of any group of economic poisons of comparable importance.

We have extensive knowledge of their toxicological properties, based both on observations of humans and on long-term animal experiments. We know the principal routes by which the substances enter the body, and the manner in which an excess first manifests its effects. We know what control measures are necessary to prevent absorption, but if these measures are faulty, we have, in determination of red cell cholinesterase activity, a sensitive means of detecting absorption before the individual experiences symptoms. And finally when accidents do occur, we have an antidote that time and again has proven its effectiveness as a life-saving measure. Poisoning can be prevented, as has been demonstrated by commercial spray operators who use parathion on a large scale month after month with no illness among their personnel. It remains only for continued education to make this record of safety industry-wide.★★

WASHINGTON REPORT

(*From Page 65*)

against the burrowing nematode — the cause of "spreading decline" among a variety of crops, but particularly citrus. Treatment for spreading decline usually calls for pushing over the affected trees, pulling the stumps, removing all refuse from the area, and leaving the ground dormant for one or two years. The area is treated with a soil fumigant. Notable success has been achieved to date and Poucher feels that the program can near successful conclusion through a determined effort beginning about the first of April. This will be after all the fruit is picked, and when growers can take time for this important grove management operation.

* * * * * * *

Florida citrus interests are also much concerned over the Food & Drug Administration's decision to consider the use of fungicides applied post-harvest as coming under the provisions of the preservative sections of the Food & Drug Law. Obviously this adds an additional labelling requirement for the citrus industry. Some members of the industry would rather have the post-application of fungicides for the purpose of preservation considered under terms of the new Miller Law.

This is but one aspect of the problem, and some farm organizations may make quite an issue of this matter later on this year. The National Agricultural Chemicals Association is following the situation closely.

* * * * * * *

Latest Farm Radio News Service platter of the National Plant Food Institute goes to a record number of stations in the United States and Canada. Louis H. Wilson, Director of Information, has produced his fifteenth series featuring the following subjects and speakers: "Career

Opportunities in Agriculture" by Dr. Russell I. Thackrey, Executive Secretary, American Association of Land-Grant Colleges and State Universities; "Let's Cut Farming Costs" by R. H. McDougall, President, National Association County Agricultural Agents; "Cover For Your Conservation Reserve Acres" by D. A. Williams, Administrator, Soil Conservation Service, U. S. Department of Agriculture; and "Grassland and Your Food Bill" by Dr. Howard B. Sprague, Vice President, American Association for the Advancement of Science, and Head of the Department of Agronomy, Pennsylvania State University.

The National Agricultural Chemicals Association is planning its first release for the new year about mid-January featuring four special reports on safety. More information as soon as reaction is received.★★

PHYTOPATH MEETING

(*From Page* 41)

use of soil fungicides. He said that many root-rotting diseases are caused by a complex of disease organisms. Little scientific effort has been made yet to identify accurately these complexes. But, he said, as we learn more about these complexes, the greater use of soil fumigants is practically guaranteed.

In addition to his expressed belief that systemic chemicals may prove to be the most desirable soil fungicides, Mr. Koch said he feels there is a hidden promise in many chemicals that have already been tested and laid aside as "not good enough." We need "continued emphasis on new applications of existing products," he said.

Mr. Koch suggested also a stepped-up search for chemicals that would stimulate the growth of soil organisms that are normally antagonistic to specific soil disease fungi.

Mr. Daines cited advances in fruit disease control in Eastern United States as support for his view that the agricultural chemicals industry faces a bright, expansive future.

He said that the rapid rate of development of important new organic fungicides that has marked the past 25 years shows no signs of abating. For example, Pennsylvania State College this year, was testing more than a dozen new experimental fungicides against apple disease organisms.

Apple growers in the East have been rewarded not only with better disease control by the use of new fungicides, but have gained such important secondary bonuses as better finish on their fruit, higher yields, better fruit-keeping quality, more vigorous trees, and some insect and mite control.

Mr. Daines also commented on the feasibility of mixing these fungicides to broaden their total effectiveness. New Jersey experiments showed that when either zineb or captan was used alone, sooty blotch on Golden Delicious apples averaged about 13 percent. A spray mixture of zineb and captan reduced disease incidence to nearly 3 percent.

The following were elected officers for 1957:

President — Dr. George Fischer, Washington State College, Pullman, Wash.

President-Elect — Dr. Paul R. Miller, United States Department of Agriculture, Beltsville, Md.

Vice-President — Dr. Glenn S. Pound, University of Wisconsin, Madison, Wisc.

Councilor-at-Large — Dr. Roy Young, Oregon State College, Corvallis, Ore.

Secretary — Dr. William Hewitt, University of Calif., Davis, Cal.

This year's conference officers are: president, W. B. Albert, S. C. Agricultural Experiment Station, Clemson, S. C., vice-president, E. G. Rodgers, University of Florida, Gainesville; and secretary-treasurer, W. K. Porter, Louisiana Agricultural Experiment Station, Baton Rouge, La. Dr. J. K. Leasure, Dow Chemical Co., Midland, Mich., served as chairman of the program committee.

All sessions of the meeting will be held in the Bon Air Hotel.

Freight Rate Increases Authorized by I. C. C.

The Interstate Commerce Commission has granted Eastern railroads a 7% freight rate increase and Western railroads a 5% increase effective five days after publication of the new schedules. According to the Commission, these increases will cost shippers approximately 400 million dollars a year. Application for a 7% increase on the part of the Southeastern railroads is also pending and experts believe it will be granted in view of the increases granted the Eastern and Western roads.

These increases are separate and apart from the proposal of railroads for a general 15% increase although the Commission has stated that it considers them a part of the 15% rather than in addition to it. This view, however, is not shared by either the Eastern or Western roads.

Phosphate rock not further processed than ground, including phosphatic clay and phosphoric sand, was made subject to a maximum increase of 30¢ per net ton. Muriate of potash, manure salts, sulfate of potash and sulfate of potash magnesia were made subject to a maximum increase of 50¢ per net ton.

The NPFI estimates that holddowns which were secured on phosphate rock and potash will result in direct savings to the fertilizer industry of more than $3,900,000 annually. In addition, they indicate there will be further substantial savings to the fertilizer industry which will result from the reduction of the increase of 7% proposed by the railroads to 5% on interterritorial shipments and shipments within the western district.

Paul Truitt of the National Plant Food Institute and several industry members presented statements opposing the proposed freight increase before the Interstate Commerce Commission in behalf of the National Plant Food Institute. Among statements presented were those by Robert T. Smith, Davison Chemical Co., and William H. Stevens, economic consultant, Kansas.

On the same day on which the Interstate Commerce Commission granted the above mentioned increases, Canadian Railways were authorized by the Canadian Board of Transport Commissioners to increase freight rates another 4% effective January 1st, 1957. This is in addition to the 7% increase authorized during the summer.

Spring daffodil field near Tacoma

Majestic Mt. Rainier Overlooks the City of Tacoma, National Headquarters of PENCO® Agricultural Chemicals

TECHNICAL PRODUCTS: DDT in powder, flake, and new lump form — PENTECH, the friable grade of technical DDT — BHC, technical grades low gamma and high gamma (14 and 46% gamma content)—Lindane — Sodium Chlorate.

FORMULATED CONCENTRATES: Calcium Arsenate — DDT — BHC — Chlordane — Malathion — Parathion — Lindane — Toxaphene — Aldrin — Endrin — Heptachlor — Natural Cryolite — and others.

PENCO Agricultural Chemicals will be relied upon again in 1957 by scores of formulators and distributors. They know that buying from this 106 year old chemical producer insures quality products and dependable service from close-by plants and stock points . . . coast to coast. Competent technical assistance is available. You'll do well in '57 to depend on PENNSALT.

PENNSYLVANIA SALT MANUFACTURING COMPANY OF WASHINGTON

Aurora, Ill. TACOMA, WASHINGTON Bryan, Tex.

Berkeley, Calif. Los Angeles, Calif. Montgomery, Ala. Portland, Ore.

WESTERN DIVISION — PENNSYLVANIA SALT MANUACTURING COMPANY

Producing Chemicals for Farm, Home and Industry for Over 106 Years

Pennsalt Chemicals

APHIDS ON ALFALFA

(*Continued from Page 57*)

ber, as high as 14,500 aphids per square foot of crown, were recorded in Oklahoma County. During the same period, moderate to heavy infestations were reported from southeastern Kansas. In Nebraska, winged adults and young nymphs could be found under the snow in the southeastern area. The spread in November was greater in the Yuma area of Arizona than at the end of summer, with the aphid being in almost all alfalfa fields. Newly planted alfalfa, however, was not attacked as severely as in 1954. Predators appeared to be a very important factor in the control of the spotted alfalfa aphid in Arizona. As in the case of the pea aphid, the spotted alfalfa aphid had survived the early freezes in Utah. In late October, aphids were collected again in Alachua County, Florida. This was the second collection for the county, and counts averaged 15 per 200 sweeps.

Mediterranean Fruit Fly Program

THE December 1 report on the status of the Mediterranean fruit fly eradication and regulatory program continues to be encouraging. The insect has been found in 28 Florida counties, with an estimated acreage of over 764,000 being involved. Since initiation of the program in May, more than 5,500,000 acres have been treated with a bait spray. Granular insecticides have been applied to over 28,000 acres. As of December 1, 1956, there was known to be approximately 106,000 acres which would require additional bait spray treatment. Of the 28 counties which had been involved, 8 counties have been released from the spraying program, and citrus no longer requires fumigation or a certificate for movement. Such restriction is not lifted unless it has been at least 90 days since the last specimen of the fly was collected. Not included in the above 8 is Palm Beach County, which was due to be placed in the free category December 11. As of December 1, spraying had been discontinued in six counties, but fumigation and certification requirements still held. Spraying, fumigation and certification was still in effect in the remaining 14 counties.★★

CONTACT SPRAYS

(*Continued from Page 55*)

sulted in a control level that was statistically similar to the standard ziram protectant treatment. The combination of contact and protectant sprays provided better control of scab than when a contact fungicide was used alone. When all the ground, as well as the trees in a block of trees, was sprayed twice with Corona CM-220 in the dormant season, and the trees were subsequently sprayed five times with ziram, the incidence of scab was at a very low level (3 lesions on 200 nuts examined on 5 trees).

The development of pecan scab on nuts was only moderate in the Paden, Oklahoma, plots in 1955, and almost no scab was found on foliage in the test plots. Statistical analysis of the yield data indicated that there were no significant differences between treatments. All conclusions are therefore drawn from lesion counts alone. None of the pecan trees sprayed with any of the contact fungicides showed symptoms of toxic injury at any time during the growing season. However, pasture grass was damaged beneath trees sprayed with Corona CM-220 and Dowicide G.

As pecan orchards are usually sown to some kind of cover crop plant or to grass, and are pastured, the residue levels left on plants on the orchard floor after the application of contact fungicides is a matter of importance. The arsenic and mercury residue levels from Corona CM-220 and Puratized Agricultural Spray treatments, respectively, were determined on grass samples collected periodically for a 6-week period after spraying. By the end of 6 weeks, on a dry-weight basis, the arsenic level had fallen from an initial level of 1885 parts per million to 11.5 ppm

TABLE 3.

Scab lesions on August 18, 1955, on nuts from Squirrel pecan trees sprayed with contact, protectant, and combined spray schedules, Paden, Oklahoma.

Treatment	Average number of scab lesions per nut
Tree and ground spray of Corona CM-220 + ziram[a]	0.01[b]
Dowicide G + ziram	0.3
Corona CM-200 + ziram	0.6
Puratized Agricultural Spray + ziram	0.9
Ziram only	2.5
Corona CM-220 only	5.9
No fungicide	88.7

[a]Adjoining but not in the same field plot design as the other treatments.
[b]The difference between any 2 means not occurring together in the same bracket is significant at the 5% level. The differences between the means and the unsprayed control mean are significant at the 1% level.

and the mercury level from 293 to 3.5 ppm. From these studies, the minimum length of time before no residue could be detected in grass from an orchard sprayed with Corona CM-220 or Puratized Agricultural Spray would be longer than 6 weeks. The arsenic and mercury levels were nil in mature pecan kernels from nuts harvested from treated trees at the end of the growing season.

A critical evaluation of contact fungicides for the commercial control of pecan scab can be made only in orchard tests in years of heavy infection. In 1955, a year of relatively moderate scab incidence in the Paden, Oklahoma, spray plots, the use of contact fungicides alone afforded satisfactory control.

In a similar field test in 1956, a schedule consisting of only two spray applications of the contact fungicides Puratized Agricultural Spray or Dowicide G afforded excellent control of pecan scab until the end of June. By late August, however, without the addition of a summer protectant schedule, the severity of scab on nut shucks was the same on the trees receiving the contact fungicides as on those left unsprayed.

It is probable that in a season favorable to the development of the disease, contact fungicides would be ineffective alone, but would be valuable adjuncts to a protectant spray program.

At present, the principal factors limiting the commercial use of eradicant fungicides in pecan orchards would seem to be the residues left on forage plants beneath sprayed trees in the orchards, and the cost of certain promising contact fungicides. The ideal fungicide would be one that decomposed quickly after exerting its eradicant effect, and that was relatively inexpensive. A search for such materials is being conducted at the Oklahoma Station.

PESTICIDE SCHOOL

(*Continued from Page 45*)

"I am still looking for a more effective fungicide to control brown rot," the pathologist declared.

Entomologist C. R. Cutright said he had not received a grower complaint on codling moth for nearly two years. His test program in 1956 included trials with a number of new materials. These included Carbide and Carbon's 7744 and Chemagro's Dipterex. The latter may not reach the recommended list because of the phytotoxicity danger when used at the rate needed for moth control.

A new principle of placing a mixture of insecticide and fertilizer in a strip or band beneath plant seeds was explained by L. H. Rolston, Ohio entomologist. In an experiment to test control of corn rootworm, Dr. Rolston used aldrin and heptachlor at the rate of ¾ lbs. actual material per acre mixed with a 10-10-10 fertilizer and banded in the row beneath the seed.

This combination had no adverse effect on plant stand or yield, Dr. Rolston pointed out, and in his opinion it is the easiest way to treat soil with insecticides.

Potato growers are looking for a good, all-purpose spray to control leafhopper and flea beetle, Dr. J. P. Sleesman told the OPI conference. At present there is no single material that will accomplish this, since some chemicals will not check damage from flea beetles, although they are effective on leafhoppers.

In 1956 tests, Dr. Sleesman used DDT at ¾ lb.; CC 7744 at 1.13 lb.; and Stauffer R-1303 at ¾ lb. and all gave good control of leafhopper. For flea beetle control he used dieldrin at ¾ lb.; Thiodan at ¾ lb. and endrin at .38 lb. per acre. He recommended using one chemical from each group as a combination spray or else in alternate applications.

Dr. E. K. Alban of Ohio State University reported satisfactory results with tests of three new herbicides for controlling weeds on potatoes, beans and sweet corn. Geigy 444 at 6 to 8 lbs. per acre was effective on grass control in potatoes and sweet corn, but caused some damage to snap beans at these rates. Simazin at 1½ lbs. per acre was outstanding as a pre-emergence spray for all crops mentioned above. Reasonably good control of foxtail and crabgrass resulted from applications of Neburon at 2 lbs. per acre.

Stauffer's R-1303 was the only insecticide of a group of four that gave acceptable control of two-spotted mites. It was applied at the rate of ¾ lb. actual material per acre.

Tests with two pre-emergence chemicals for crab grass control by Dr. R. R. Davis, Ohio agronomist, brought varying results. He stated that Ohio research has not reached the point where recommendations can be made. Excellent control resulted from early post-emergence treatment (June 21) with PMA at .18 oz. per 1,000 sq. ft., followed by four successive applications throughout mid summer.

A note of warning was sounded by Dr. J. D. Wilson, Ohio Station plant pathologist, regarding nematodes. It was his belief that in the next five years, researchers must place more and more emphasis on developing materials to limit the damage from these soil-borne organisms. Dr. Wilson said also he thought the only way

to overcome radish yellows disease is to breed for resistance.

Main feature of the annual OPI banquet November 19 was a slide lecture by Dr. C. R. Cutright on pesticide usage in South America.

New officers elected to serve the Ohio Pesticide Institute during 1957 were: M. G. Farleman (Standard Oil) president; P. C. Pratt (Leatherman Seed Co.) 1st vice-president; J. J. Coyle, Jr. (Rohm & Haas) 2nd vice-president; J. D. Wilson (Ohio Experiment Station) secretary; and V. H. Davis (Ohio Farm Bureau) treasurer. Newly elected to the board of directors were W. Z. Majure (Calif. Spray Chemical) and Bruce Simms (American Cyanamid).★★

TVA AMMONIATOR

(*From Page 33*)

In seeking to overcome these difficulties, we tried adding phosphate rock and sulfuric or phosphoric acid to mixtures of superphosphate and potash. This method proved to be quite beneficial; the granulation efficiency was improved, the granules were stronger, and the moisture content was so low that little or no drying was necessary. These improvements were attributed to the heat of reaction of phosphate rock and acid, and to the plasticity of the fresh superphosphate formed in the granules. We found, somewhat to our surprise, that the reaction of the acid and rock was rapid and substantially complete in a short time.

Data for typical pilot-plant tests are presented in Table III. In making 0-20-20, concentrated superphosphate, phosphate rock, sulfuric acid, and potassium chloride were the raw materials. The amount of phosphate rock and sulfuric acid was such as to form about 700 pounds of superphosphate per ton of product. The acid:rock ratio was about 0.63 pound of H_2SO_4 per pound of rock, which is believed to be about the proportion generally used in making superphosphate. The granulation efficiency was satisfactory; about 61% was onsize, and the remainder was mostly oversize. After crushing the oversize, 87% was onsize. The conversion of the P_2O_5 content of the phosphate rock to an available form was 98% when analyzed 3 days later. The product as discharged from the cooler contained 3.7% moisture; after curing 1 week in an open bin, the moisture content was 3.2%. It was then bagged and stored; after 6 months there was no caking and very little bag set.
(Table III)

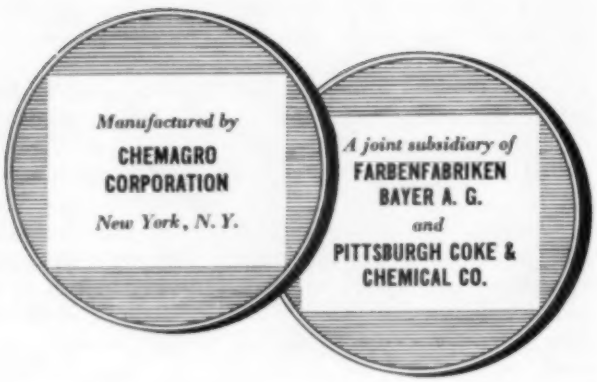
In a similar test with 0-14-14, about half of the superphosphate was supplied as cured material and half was formed from phosphate rock and acid. Granulation was controlled readily by controlling the amount of water. No recycle was required.

In another run on 0-14-14, all of the superphosphate was derived from phosphate rock and acid. About 50% recycle was required to control granulation. Granulation was controlled by water addition and recycle at such level as to provide about 50% fines (-16 mesh) for recycle. The P_2O_5 availability was 95% after 7 days' storage in an open pile.

Phosphate rock and phosphoric acid were used in making granular 0-26-26 and 0-14-0. The acid:rock ratio was somewhat less than that usually used in making concentrated superphosphate. About one third of the concentrated superphosphate was formed in the process, and the remainder was supplied as cured material from the TVA plant. Steam was added in the amount required to obtain good granulation. Granulation was quite good, and conversion of phosphate rock to an available form was quite satisfactory after only 1 day. In other runs, granular 0-48-0 was made entirely from phosphate rock and phosphoric acid; about 40% recycle was used to aid in granulation

The granules, after cooling, contained about 4% moisture and appeared to have satisfactory physical properties. They were hard, free-flowing, and resistant to abrasion.

Further work on the use of phosphate rock and acid to make granu-



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lar superphosphates and phosphorus-potassium fertilizers is in progress.

Ammoniation and Granulation in a Pan Granulator

AN inclined, rotating pan has been used extensively to pelletize various materials such as iron ore and raw materials for Portland cement production. In some foreign countries the inclined pan granulator is used to granulate superphosphate or mixed fertilizer. It has been reported that both ammoniation and granulation have been carried out in the pan granulator.

The advantage claimed for the pan granulator is that a classifying action takes place such that the largest granules are discharged continuously over the rim of the pan, and the small granules and fines are retained for further build-up. This action is said to result in efficient, uniform granulation.

A small pan granulator, 3 feet in diameter was built to study granulation of ammonium nitrate. Good granulation was obtained by spraying hot, concentrated ammonum nitrate solution on fine, crystalline ammonium nitrate. As much as 85% of the product was obtained in the size range of 6 to 16 mesh.

Tests were then made to determine whether the pan granulator would be useful for ammoniation and granulation. In these tests, concentrated superphosphate and potassium chloride were fed continuously to the pan through a chute. Nitrogen solution and sulfuric acid were fed through distributors submerged in the material in the pan. The proportions of these materials were such as to make a 10-20-20 fertilizer.

After several attempts, fairly good granulation was obtained. Figure 1 is a photograph of the pan granulator. The pan was not rotating when the picture was made, because it was difficult to get a clear picture with the pan in motion. Table IV shows comparative data for the production of 10-20-20 in the pan granulator and in the TVA continuous ammoniator. The results are generally poorer with the pan granulator; the ammonia loss was high, and the granulation efficiency was not as good. The submerged distributors tended to interfere with the classifying action of the pan. When acid was applied by spraying it on the surface of the bed rather than by a submerged distributor, severe fuming took place. (Figure 1 appears on Page 31, Table 4 appears on Page 33.)

The tests are not considered to be conclusive. It is quite possible that most of the difficulties experienced in the test could be overcome by modifying the design of the pan and the arrangement of the distributors. However, on the basis of these tests, it was considered unlikely that the pan granulator would have any significant advantage over the cylindrical continuous ammoniator.

Use of Coarse Potash

IT has become rather common practice to use coarse potassium chloride as an aid to granulation of low-nitrogen, high-potash grades that are otherwise difficult to granulate. Some questions have been raised as to what size range of potassium chloride particles is most effective in aiding granulation. In an attempt to shed some light on this question, a run was made in the pilot plant in which four sizes of potassium chloride were used.

The fertilizer produced in these runs was 4-16-16. The raw materials used were nitrogen solution, anhydrous ammonia, ordinary and triple superphosphates, sulfuric acid, and potassium chloride. Granulation was controlled by varying the sulfuric acid in the range of 100 to 180 pounds per ton of product.

Four sizes of potassium chloride were used. The coarsest was mostly 6 to 10 mesh, the next was 10 to 16 mesh, the third was 16 to 48 mesh, and the finest was mostly finer than 48 mesh. The most efficient granulation was obtained when using the 10- to 16-mesh potash; 70% of the product was in the desired size range of 6 to 16 mesh, 22% was oversize, and 8% was undersize. Very nearly as good results were obtained with the 6- to 10-mesh potash. Distinctly poorer results were obtained with the 16- to 48-mesh potash, and very poor results were obtained with the minus

48-mesh potash. The granulation efficiencies were 63, 70, 49, and 28% for the 6- to 10-, 10- to 16-, 16- to 48-, and minus 48-mesh potash sizes, respectively. The amount of sulfuric acid required to obtain as good granulation as could be obtained with each potash size increased from 107 to 179 pounds per ton of product as the potash size decreased.

It is concluded that the most effective potash particle sizes for promoting granulation of 4-16-16 are 6 to 10 mesh and 10 to 16 mesh; and that potash smaller than 28 mesh is relatively ineffective. In other runs, mixtures of fine and coarse potash were used. The granulation efficiency was about as high with the mixtures as when all coarse potash was used. This may indicate that only a limited number of nuclei are needed to promote granulation.

A question has been raised as to whether the use of granular potash in making granular fertilizer may increase the caking tendency of the product. Bag-storage tests were made of several grades made with granular potash or with nongranular potash. There was no indication that the particle size of the potash affected bag set or caking to any appreciable extent.

Caking of Granular Fertilizers

GRANULAR fertilizers are much less subject to caking during storage than nongranular mixtures of the same formulation and moisture content. However, granulation is not an infallible panacea for caking problems. Research by USDA *(1, 6)* has shown that many factors are involved in caking of granular and non-granular fertilizers. These factors include size and shape of granules, moisture content, curing period, formulation, and amount and kind of conditioner added, if any.

In the course of TVA's work on granulation of high-analysis fertilizers, the experimental products have been subjected to bag-storage tests. In some of these tests, caking has occurred. Microscopic examination of some of the caked products showed that the bonds between granules consisted of crystals of soluble salts that had formed on the surface of the granules during the storage period and had knitted the granules together. The crystals that formed the bond were identified as one or more of several compounds, such as potassium nitrate, monoammonium phosphate, and a urea-ammonium chloride double salt, and depended on the composition of the fertilizer granule.

It is pointed out that products that did not cake were prepared from the same formulations by better granulation, more thorough drying, longer curing, conditioning, or a combination of these factors.

Further work is being done to get a better understanding of the mechanism of caking and methods of preventing it.★★

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FERTILIZER VIEWS

(*From Page 60*)

difference is noted in their respective rates of decomposition. Another observation made by the author based on the research results is that sulfate of ammonia used rationally may be applied on all crops in the greenhouse, that is, at the rate of 400 to 500 pounds per acre, when the soil is moist and crops need nitrogen. Dr. Owen believes also in determining by suitable tests the nitrogen needs or nitrate levels of the crop during its growth cycle. This practice is being followed in the United States by many progressive farmers, and by plant scientists who test for phosphorus and potash as well as for nitrogen. Growing crops in the greenhouse can certainly be described as intensive agriculture, and undoubtedly the art of tissue testing to determine plant nutrient levels could advance the practitioner's use of fertilizer to a high level of efficiency. The trend is definitely toward higher accuracy and less guessing in the use of fertilizer.

Low Magnesium Levels in the Blood

WE reported a while back on tetany in livestock caused by a deficiency of magnesium in the blood stream. Technically this is referred to as hypomagnesaemic tetany. In Great Britain and on the Continent discussion of this subject has been "hot" for some time, and many farmers have been demanding supplemental magnesium in their mill feeds destined for cattle and sheep. However, not all feedstuffs manufacturers believe this is necessary. During the past few months I have heard of several cases of magnesium deficiency in animal metabolism arising in both the Corn Belt and Northeast regions of our own country. Perhaps the subject deserves more attention and research than has heretofore been given it.

About 70% of the magnesium in the body of a normal animal is found in the bones, the remaining 30% being distributed throughout the soft tissues. Like calcium and phosphorus, magnesium is needed for normal development of teeth and bones, and it serves also to activate the phosphatase enzyme which ensures the metabolism of carbohydrates.

Different kinds of tetany are reported by the specialists. Fertilizer people are interested in the subject mainly as it involves the use of magnesium compounds in the fertilization of grasslands and pastures. Magnesium tetany is associated with a low blood magnesium in which the blood calcium level is normal. "Lactation tetany," "grass tetany," and "transit tetany" are terms used to describe hypomagnesaemic tetany. Their application to the condition is not always accurate. It is reported that low blood calcium is not always associated with magnesium tetany. The utilization of magnesium by the animal is related to the influence of other minerals on the digestion. Tetany can occur in calves reared for too long a period on whole milk without supplementary feedstuffs; in maiden heifers and cows in lactation grazing on spring or autumn grass at peak growth, in fattening bullocks barn fed in late winter; and in sheep towards the end of a bad winter. Low levels of hay to the sheep's diet appear to aggravate the condition.

The following mineral relationships are of interest to us. If calcium in the blood is high and phosphorus low, the prolonged intake of magnesium in excess of requirements will cause a loss of body calcium, and if the magnesium intake is very much in excess, the calcium loss can become very serious. In other words, a correct balance exists among magnesium, calcium and phosphorus: If the level of magnesium is raised, that of calcium and phosphorus must be raised in proportion to maintain the right balance. The mechanism is delicately adjusted and its workings are complex. Once more it can be said that our knowledge of the interrelationships of the major, secondary and minor nutrients in plant, animal and human metabolism is woefully limited.★★

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G. L. F. Appoints Papai

Michael J. Papai has been appointed assistant director of purchasing by the Soil Building Division of Cooperative G.L.F. Exchange, Inc., New York. Mr. Papai will handle the purchasing of pesticides.

Mr. E. H. Phillips, director of purchasing, who formerly handled the pesticides, has taken over the plant food chemicals and packages as well as miscellaneous farm chemicals.

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Correction

On page 48 of the November issue of *Agricultural Chemicals*, two of the individuals in the photograph of the American Pesticide Control Officials were incorrectly identified.

E. R. Winterle, Florida, was mistakenly identified as W. C. Geagley, and Mr. Geagley was identified as F. H. Gates. Mr. Gates was absent when the photo was taken.

GARDEN SHOW

(*From Page 52*)

now available. John Dugan, president, and J. Morse Ely, executive vice president, received visitors to the booth.

Diamond Black Leaf Co., Cleveland, O., featured their insecticides and fungicides in small packages and Velsicol Corp., Chicago, stressed their chlordane emulsions for use by formulators.

Plant Marvel Laboratories, Chicago, demonstrated four products in aerosol containers, for rose pests, African violets, household insects and the fourth, a new "i-Bomb" containing three powerful insecticides plus alcohol, for all-purpose use. Introduced, also, was "Lawn-Marvel," a new 28-18-8 fertilizer for lawns, trees, shrubs and evergreens. J. O. Slater, president, called attention to a new island display stand for dealers and to the company's "money-back" guarantee on all its products.

Noted among others who offered plant foods were Ra-Pid-Gro Co., Dansville, N.Y., Armour Fertilizer Works, Chicago, Stadler Fertilizer Co., Cleveland, O., and Stim-U-Plant Labs, Columbus, O.

Donaldson Co., Inc., St. Paul, Minn., offered a "Racket Robber" insecticide, dispensed as a fog through an attachment on the container which is operated from any rotary power mower. Also shown by Donaldson was their "Spray-Kane" for use by lady gardeners to dispense garden chemicals "the easy way."

H. D. Hudson Mfg. Co., Chicago, had a representative display from their extensive line of sprayers and dusters for both manual and power operation. Molded Specialties, Inc., Cleveland, O., demonstrated a new "'Tri-Con" sprayer nozzle with reversible cap for stream or spray, also valves for boosting pressure and other accessories.

D. B. Smith & Co., Utica, N.Y., introduced a "Rite-Size" 2-gallon compressed air sprayer and a "Blizzard" continuous sprayer with seamless brass pump and solid copper tank. Demonstrated, too, was a new safety valve to prevent contents of a tank from squirting into the operator's eyes as he opens it.

Sprayers & Nozzles, St. Petersburg, Fla., showed a sprayer with an all-purpose baffle, which permits spraying up, down, or to either side or full stream up to 30 feet high.

Bradson Co., Inc., 16-year-old San Diego, Calif., firm, announced the recent completion of a new branch plant at Saline, Mich., which Phil George, general sales manager, said will enable this manufacturer of garden sprays to give faster delivery service in the middle west.

PROFESSIONAL *Directory*

ALVIN J. COX, Ph.D.
Chemical Engineer and Chemist

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Index to ADVERTISERS

Tale Ends

THE average nutrient content of fertilizer mixtures sold in the U. S. continues to grow. Latest figures, for 1955-56, based on estimates by the U. S. Department of Agriculture, put the average nutrient content of fertilizers sold during 1955-56 at 28.91%, which compares with 27.9% in 1954-55. In 1941 the average nutrient content of fertilizer mixtures was only 20.22%. Thus in the past fifteen years there has been an increase of over 42% in plant food content of fertilizers.

While average nutrient content has been gaining steadily, fertilizer tonnage has finally started to taper off. Figures for 54-55 showed a very minor decline from the previous year (0.22%). Preliminary estimates by the U.S.D.A. on 55-56 consumption, however, suggest that for this year the decline will be of much more substantial proportions when all the columns are added. An estimate released last month by the National Plant Food Institute indicated that 55-56 consumption might be almost four and a half percent under the figure for the previous crop year. If these estimates prove to be correct, even the continuing gain in nutrient content may not be sufficient to prevent a slight decline for the first time in years in overall consumption of plant nutrients.

AC

Fifteen to eighteen months ago when the first reports started to come in suggesting that boll weevils were developing resistance to the chlorinated hydrocarbon insecticides, there were many who doubted this could be true. Today resistance has been pretty well established. One result this past season was a rather substantial movement back to calcium arsenate for control. Parathion also showed a big gain in use on cotton to control boll weevils resistant to DDT, BHC, etc. One producer of parathion reported a ten-fold increase in use of parathion last season, and estimates that, during the 1957 crop year, use of parathion for this purpose may double again.

AC

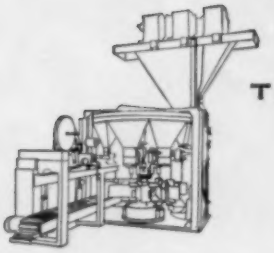
Agricultural chemicals are to be promoted on a new radio program, the Red Foley Show sponsored by Dow Chemical Co. The half-hour show will be heard each Saturday at 12:30 P.M. (CST) over the ABC network. Foley, an entertainer particularly popular in the rural areas, for what used to be known as hill billy music, and is now referred to more diplomatically as "country music," is widely known through his television show, Ozark Jubilee. The new series, to originate from Springfield, Mo., will have its premiere performance January 19th.

AC

One shot dosage of crops with all-purpose pelletized fertilizers was predicted as a possibility for the future in a talk by Dr. Harry B. Walker, professor emeritus of agricultural engineering, University of California, Davis, Calif., in a recent talk before the American Society of Agricultural Engineers, meeting in Chicago. The various fertilizers needed by a crop would be incorporated into a dry pellet, with the selected plant nutrients timed to be released gradually as needed during the growing season. Dr. Walker indicated that, although some technical problems remain in the manufacture of fertilizer pellets of uniform size, marked progress has already been made.

AC

Grub Leonard reports from the land of sunshine, sailfish, sea serpents and sin. Just back from a three weeks cruise through the Caribbean, he is wintering in Sarasota, Fla., all recovered from the operation that laid him low last fall. Come March 6, we expect him to show up at the Fairmount, complete with white shoes and his perennial good humor.



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